

STATE BUILDING CODE COUNCIL

Washington State Energy Code Development Standard Energy Code Proposal Form

Log No. 21-GP2-073 TM

		5/27/22
Code being amended:	Commercial Provisions	Residential Provisions
Code Section # R405.3 ,	R406, Chapter 6	
Brief Description: This p	proposal updates Section R406 a	nd requires additional energy efficiency credits.
Purpose of code change	::	
goal of RCW 19.27a.160.	This 2021 Section R406 code chang These savings are primarily attribute	with RCW 19.27a.160. This proposal is designed to meet the high-level ge proposal is expected to lead a 10% energy reduction over a 2006 and to the credits required to comply with code in Section R406.3, along
and by the 2021 IECC add (representing the wide ra and if needed, reassigne	ditions are first assessed to determi ange of residential construction with d.	n 406 options: The base code (prescriptive) changes made in 2018 ne the base energy use of seven modeled prototype buildings hin the state). Based on this, the value of each credit is reassessed 0% to 22.5% due to more aggressive prescriptive envelope
 Option 1.6 redu requirements. Option 1.7 has be reasonable with Dual fuel heat period Updates have be credit values aver space heating seems. 	peen removed due to more aggressi I the updated prescriptive requirem ump (gas backup) for space conditic een made for credit 7.1 Appliance Povarded for load reduction measures	oning has been added to Table R406.2 Fuel Normalization ackage (envelope and air tightness) have been broken out between two th higher annual energy end use intensities, in some cases, can
Your amendment must	meet one of the following criteri	a. Select at least one:
Addresses a critical	life/safety need.	Consistency with state or federal regulations.
The amendment cla	rifies the intent or application of	Addresses a unique character of the state.

Addresses a specific state policy or statute.

(Note that energy conservation is a state policy)

Check the building ty	pes that would be im	pacted by your code o	hange:				
⊠ Single family/duplex/townhome		☐ Multi-family 4 + s	tories	Institutional			
Multi-family 1 − 3 stories		Commercial / Ref	tail	Industrial			
Your name	Henry Odum, PE		Email address	henry@ecotope.com			
Your organization	Ecotope, Inc.	Phone number		(206) 596-4715			
Other contact name	David Baylon						
Economic Impac	ct Data Sheet						
Is there an econom	s there an economic impact: Yes No						

First cost and energy savings

you answered "No" above, explain your reasoning.

First cost and energy savings estimates have been developed using an estimating procedure used by the Northwest Power and Conservation Council (NPCC). This method uses 6 prototype single family homes and one multi-family building to assess regional energy impacts. This includes: a 1344 sf rambler (crawl space and slab), a 2200 square foot rambler (crawl space and slab), a 2866 sf home with half basement, a 5000 sf home with a full basement, and a multifamily dwelling units (modeled a 2 story, exterior entry, low-rise building and a 3-story double loaded corridor). For each building both cost and energy savings are estimated for each prototype and each measure.

Briefly summarize your proposal's primary economic impacts and benefits to building owners, tenants, and businesses. If

First Cost: The first cost included in Tables 1 and 2 were developed using multiple sources of information:

- NPCC, the Regional Technical Forum (RTF), http://rtf.nwcouncil.org/ This is a federally mandated multi-state compact that develops the efficiency resources for the region's electric utilities
- Navigant is a business consulting firm which provides resource planning for both gas and electric utilities, including gas utilities in Washington State. http://www.navigant.com/industries/energy/
- CEE is the Consortium for Energy Efficiency. CEE is the US and Canadian consortium of gas and electric efficiency program administrators. http://www.cee1.org/
- This study also uses cost information provided to the SBCC by Ecotope.
- Inflation has been accounted for on any cost estimates sourced from previous years

The cost of each option will be included in final draft. Cost are considered for 6 single family and 1 multi-family prototype. For single family prototypes, the crawlspace and slab variations have already been incorporated in the '1344sf' and 2200sf' prototypes – which is why only 4 cost numbers will be shown.

Energy Savings Estimates

The energy savings estimates will be included in final draft. They are being developed using 6 single family and one multi-family prototype. For each building prototype, each predominant HVAC system (gas furnace, gas furnace with AC, central heat pump and Ductless heat pumps with zonal electric) is modeled and located in various weather climates within the state. The energy savings attributed to each option are then weighted to consolidate energy savings estimates for the 4 primary categories of homes in Section R406.3 (small, medium, large, and R-2 dwelling units). Large homes (greater than 5000sf) only compromise 2% of the total building stock – therefore energy savings estimates used for the Life Cycle Cost Analysis will be omitted from this economic analysis.

Provide your best estimate of the **construction cost** (or cost savings) of your code change proposal?

Table 1: Total Measure Costs by Single Family Prototypes

						Prototypes Weight % by Floor Area							
					1344		2200		2688		5000		
			W	eighted									
			M	leasure									
Option-Description	Gas Credit Value	HP Credit Value		Cost		15%		72%		11%		2%	
1.1 - U24 Glaze	0.5	0.5	\$	1,730	\$	991	\$	1,790	\$	1,987	\$	3,688	
1.2 - U20 Glaze	1	1	\$	2,537	\$	1,454	\$	2,625	\$	2,914	\$	5,409	
1.3 - 5% UA reduc	0.5	0.5	\$	1,261	\$	955	\$	1,270	\$	1,762	\$	476	
1.4 - 15% UA reduc	1	1	\$	3,263	\$	1,925	\$	3,255	\$	4,676	\$	5,802	
1.5 - 22.5% UA reduc	2	1.5	\$	4,721	\$	2,938	\$	4,850	\$	5,735	\$	7,852	
1.6 - 30% UA reduc	3	2.5	\$	11,235	\$	6,819	\$	12,095	\$	10,587	\$	16,991	
2.1 - 2 ACH, HRV	1	0.5	\$	2,264	\$	1,395	\$	2,284	\$	2,790	\$	5,190	
2.2 - 1.5 ACH, HRV	1.5	1	\$	5,411	\$	3,334	\$	5,457	\$	6,667	\$	12,402	
2.3 - 0.6 ACH, HRV	2	1.5	\$	6,988	\$	4,306	\$	7,048	\$	8,612	\$	16,019	
3.1a - Furnace	1	1	\$	252	\$	252	\$	252	\$	252	\$	252	
3.2a - 9.5 HSPF HP	0.5	0.5	\$	1,388	\$	1,388	\$	1,388	\$	1,388	\$	1,388	
3.3a - GSHP	1.5	1.5	\$	11,034	\$	10,900	\$	10,900	\$	10,900	\$	17,600	
3.4 - DHP	1.5	1.5	\$	1,530	\$	1,530	\$	1,530	\$	1,530	\$	1,530	
3.5a - 11.0 HSPF HP	1	1	\$	1,530	\$	1,530	\$	1,530	\$	1,530	\$	1,530	
3.6a - DHP (15% elec)	2	2	\$	5,901	\$	5,901	\$	5,901	\$	5,901	\$	5,901	
4.1 - Deeply buried	1	0.5	\$	-	\$	-	\$	-	\$	-	\$	-	
4.2 - HVAC inside	1.5	1	\$	328	\$	328	\$	328	\$	328	\$	328	
5.1 - DWR	0.5	0.5	\$	437	\$	437	\$	437	\$	437	\$	437	
5.2 - 0.80 gas DHW	0.5	0.5	\$	640	\$	640	\$	640	\$	640	\$	640	
5.3 - 0.91 gas DHW, GSHP	1	1	\$	1,009	\$	1,009	\$	1,009	\$	1,009	\$	1,009	
5.4 - Tier III HPWH	2	2	\$	955	\$	955	\$	955	\$	955	\$	955	
5.5 - CO2 HPWH	2.5	2.5	\$	3,824	\$	3,824	\$	3,824	\$	3,824	\$	3,824	
6.1 - Solar pV	1	1	\$	5,040	\$	5,040	\$	5,040	\$	5,040	\$	5,040	
7.1 - ES Appl+ventless Dryer	0.5	0.5	\$	505	\$	505	\$	505	\$	505	\$	505	

Table 2: Total Measure Costs for Multifamily prototype

		М	easure
Option-Description	Credit Value		Cost
1.1 - U24 Glaze	0.5		
1.2 - U20 Glaze	1	\$	887
1.3 - 5% UA reduc		\$	173
1.4 - 15% UA reduc	1	\$	947
1.5 - 22.5% UA reduc	1.5	\$	1,383
1.6 - 30% UA reduc	2	\$	3,779
2.1 - 2 ACH, HRV	0.5	\$	851
2.2 - 1.5 ACH, HRV	1	\$	2,034
2.3 - 0.6 ACH, HRV	1.5	\$	2,627
3.1a - Furnace	1	\$	252
3.2a - 9.5 HSPF HP			
3.3a - GSHP	1		
3.4 - DHP	2	\$	3,060
3.5a - 11.0 HSPF HP		\$	-
3.6a - DHP (15% elec)	3	\$	5,245
4.1 - Deeply buried	0.5	\$	-
4.2 - HVAC inside			
5.1 - DWR		\$	505
5.2 - 0.80 gas DHW	0.5		
5.3 - 0.91 gas DHW, GSHP	1		
5.4 - Tier III HPWH	2.5	\$	318
5.5 - CO2 HPWH	3	\$	1,275
6.1 - Solar pV	1	\$	5,040
7.1 - ES Appl+ventless Dryer	1.5	\$	505

Provide your best estimate of the annual energy savings (or additional energy use) for your code change proposal?

See Table 3 for kWh/dwelling unit or therm/dwelling unit savings (savings values are positive)

Energy Savings Estimates

The energy savings estimates below have been developed using 6 single family and two multi-family prototypes. For each building prototype, each predominant HVAC system (gas furnace, gas furnace with AC, central heat pump and Ductless heat pumps with zonal electric) was modeled and located in various weather climates within the state. The energy savings attributed to each option listed in Table 406.3 were then weighted to consolidate energy savings estimates for the 4 primary categories of homes in Section R406.3 (small, medium, large, and R-2 dwelling units). As shown in Table 1, large homes (greater than 5000sf) only compromise 2% of the total building stock – therefore energy savings estimates used for the Life Cycle Cost Analysis have been omitted from this economic analysis.

Table 3: Savings All Climates, All Systems

			S				М		MF
	gfac	gfac	ashp	zonl	gfac	gfac	ashp	zonl	zonl
Options Table 2021	kWh	Therm	kWh	kWh	kWh	Therm	kWh	kWh	kWh
mandatory req's	0	0	0	0	0	0	0	0	0
windows U=0.24	114	5	1143	173	292	5	302	348	132
windows U=0.2	160	12	1192	291	369	18	492	597	263
envelope 3 - 5% UA	18	0	1101	94	-70	-2	59	122	-34
envelope 4 - 15% UA	151	24	1243	406	288	28	528	648	223
envelope 5 - 22.5% UA	303	33	1315	581	577	41	817	1015	420
envelope 6 - 30%UA	348	55	1430	821	887	69	1158	1456	555
air leakage 1 hrv	-116	3	1059	-10	-271	19	105	111	329
air leakage 2 hrv	4	45	283	344	87	67	504	664	642
air leakage 3 hrv	91	54	414	487	530	78	762	997	934
AFUE .95	-84	34	-	-	55	51	-	-	
HSPF 9.5	-	-	248	-	-	-	328	-	
DHP HSPF 10(zonal only)	-	-	-	689	-	-	-	1129	-41
HSPF 11	-	-	371	-	-	-	980	-	
DHP HSPF 10 whole house (zonal only)	-	-	-	1154	-	-	-	2185	740
ducts inside	356	32	385	-	781	38	666	-	
drain water heat recovery	76	23	260	247	-55	33	282	318	182
dwh gas UEF 0.80	18	27	-	-	3	34	-	-	
dwh gas UEF 0.91	-28	39	-	-	12	48	-	-	
hpwh Tier III	-930	121	1407	1395	-1167	153	1761	1790	973
UEF 2.9	-813	121	1536	1512	-1099	156	1916	1941	1055
Energy Star appliances	722		824	784	625		750	776	629

Table 4: Measure cost estimates (\$/component area, SF or housing unit)

Component			(2021) \$s 2 or \$/unit	Source	
<u> </u>	Base Level	ivieasures beyond base Level	3/11/2	z or ş/unit	Source
Envelope					
Ceiling	R-60	R-60 RH Ceiling Insulation	\$		CERF
Ceiling	R-60	R-49 Advanced	\$	0.25	CERF
Wall	R-13 int Wall + R10 Foam Sheathing	R-21 int Wall + R12 Foam Sheathing	\$	1.05	6th plan
Wall	R-13 int Wall + R10 Foam Sheathing	R-21 int Wall + R-4 Foam Sheathing	\$	2.46	6th plan
Wall	R-13 int Wall + R10 Foam Sheathing	R-21 int Wall + R16 Foam Sheathing	\$	3.28	6th plan
Floor	R-30	R-38 Floor	\$	0.42	RTF-ResNCMTHouseID_v_3_0 .xlsm April 4, 2018; ShellCosts tab
Slab	R-10 4' perim	Slab R-15 4' perim	\$	0.99	6th Plan Appendix G
Slab	R-10 4' perim	Slab R-10 Full	\$	0.99	6th Plan Appendix G
Slab	R-10 4' perim	Slab R-20 Full	\$	1.33	6th Plan Appendix G
Window	U-0.30	Window U-0.25	\$		NPCC Standard workbook
Window	U-0.30	Window U-0.24	\$		NPCC Standard workbook
Window	U-0.30	Window U-0.22	\$	7.21	NPCC Standard workbook
Window	U-0.30	Window U-0.20	\$	7.21	NPCC Standard workbook
Window	U-0.30	Window U-0.18	\$	9.83	MF bids (tripleglaze-BidPrices.xl) Costs from ecowindows bids are about 26.50/sf or 8.50 incremental with contractor mark-up
Air Sealing & Ventilation					
ACH	Tested Infiltration at 3 ACH 50	Tested Infiltration to 2 ACH50	\$	0.22	RTF Workbook. ResWXSF_FY10v2_1.xls, at
ACH	Tested Infiltration at 3 ACH 50	Tested Infiltration to 1.5 ACH50	\$	0.30	\$.18/ft^2 per 1ACH50 reduction.
ACH	Tested Infiltration at 3 ACH 50	Tested Infiltration to 0.6 ACH50	\$	0.47	Dan W
Exhaust Fan	Pt Source Exhaust Fan =0.75W/cfm	Pt Source Exhaust Fan <0.35W/cfm	\$	88.12	navigant 2013
ERV	No ERV	ERV with SHR>= 0.65	\$	0.82	\$400 for WhisperComfort and \$400 for ducting
ERV	No ERV	ERV with SHR>= 0.75	\$	2.19	renewaire or lifebreath
ERV	No ERV	ERV with SHR>= 0.80	\$	2.73	high efficiency HRV with ducting (venmar, zhender)
HVAC System					,
Ducts	Code level is sealed	Ducts Inside	\$	327.81	NPCC Sixth Power Plan, Support documentation
Furnace	0.8	Furnace Upgrade to 94AFUE	\$	251.59	Navigant Sept 2011 Report for NEEP
Heat Pump	8.2 HSPF	9.5 HSPF	\$	1,387.73	SIW, linear regression from 9 HSPF pricing
DHP	Zonal Resistance	1-ton single zone DHP	\$	3,059.56	Ecotope analysis of NEEA DHP pilot program database
11.0 DHP	8.2 DHP	1-ton single zone DHP	\$	1,529.78	Ecotope analysis of NEEA DHP pilot program database
Heat Pump	8.2 HSPF	11 HSPF	\$	5,900.58	3 ton unit. ResSFExistingHVAC
multizone 11.0 DHP	8.2 HSPF	10 HSPF efficiency with no electric resistance. Reduction in elec heat but higher tonnage	\$	5,900.58	Ecotope analysis of NEEA DHP pilot program database
Domestic Hot Water					
Water Htr	0.59 EF	Gas Water Heater >=0.80 EF	\$	640.32	NREL, 2013
Water Htr	0.59 EF	Gas Water Heater >=0.91 EF	\$	1,008.56	NREL, 2013
Water Htr	0.95 EF	Heat Pump Water Heater 2 EF	\$	955.02	RTF ResHPWH.xls
DWHR	none	Drain water heat recovery pipe	\$	437.08	RTF RESDHWDrainWaste.xls
Water Htr	0.95 EF	Tier 3 Water Heater 3 EF	\$	955.02	RTF ResHPWH.xls
Water Htr	0.95 EF	CO2 Water Heater 4 EF	\$	3,824.45	RTF ResHPWH.xls
Appliances					
Dryers, refr, dishwasher	Fed pre-empted	Heat pump dryers, ES appliances	\$	504.83	RTF-ResClothesDryers, ResRef, HD.com \$420 fo HP dryer, +\$40 for Cloth washer, +\$90 for refr

List any code enforcement time for additional plan review or inspections that your proposal will require, in hours per permit application: No expected additional plan review. Structure of table is the same as previous code cycles
Housing Affordability. Describe economic impacts on housing affordability: Small homes are required to have fewer efficiency credits than larger homes. This is consistent with previous code cycles.
<u>Instructions:</u> Send this form as an email attachment, along with any other documentation available, to: sbcc@des.wa.gov . For further information, call the State Building Code Council at 360-407-9255.

All questions must be answered to be considered complete. Incomplete proposals will not be accepted.

Life Cycle Cost Analysis of 2021 WSEC: R406 Code Change Proposal

Henry Odum, Paul Kintner, Jenny Haan - Ecotope David Baylon Kevin Rose, Tess Studley - NEEA April 2022

The following documentation provides a life cycle cost assessment of the R406 code change proposal. This proposal modifies section R406. It is anticipated that adoption of this code change, along with prescriptive updates sourced from the 2021 IECC, will reduce energy use in typical new homes and low-rise apartments by 10% over a 2018 code-compliant home.

The life cycle cost approach presented builds on the methodology used in previous code development cycles. However, all energy modeling was completed from the 'ground-up' – meaning all modeled energy use, energy savings, and code-to-code comparisons were completely redone for this analysis. No assumptions or previous models were carried over from past years. The life cycle cost analysis was completed using the Office of Financial Management Life Cycle Cost Tool (Version 2020-A).

The analysis was developed by Henry Odum, Paul Kintner, Jenny Haan (all of Ecotope) and David Baylon. Ecotope completed the energy modeling, provided the first cost estimates, and the energy savings analysis. David Baylon completed the carbon equalization credit calculations, backed by Ecotope's energy modeling analysis.

Approach to the development of the R406 energy code proposal:

The following outlines the process used to develop the R406 code change proposal. It is a process with multiple steps.

Change in Scope: For the 2021 WSEC Section R406, this proposal includes credit values specific to homes with varying levels of space heating energy end use. Space heating systems without a coefficient of performance (aka gas furnace and electric resistance) use 2-3x more heating energy than a heat pump system. For this reason, load reduction measures (air tightness, envelope insulation, duct measures) have a greater impact on energy savings for this end use. The revisions to Table R406.3 are intended to capture this difference in energy savings, and reward homes with higher heating energy use with greater credit values.

Table R406.2 (Fuel Normalization credits) have also been updated to match the proposed commercial code carbon content of Washington State's electrical grid (Cambium model from NREL is calculated as 0.44 #CO2e/KWH).

Consider clarifications and implementation changes: To provide clear enforceable code language, several editorial changes have been included. Credit requirements for appliances have been strengthened. Several envelope measures have been removed and/or recalibrated to account for prescriptive code upgrades of the building envelope.

Add New Heating system: To continue to provide a diverse set of options for implementation, a dual fuel heat pump measure has been added to the fuel normalization table. This system assumes a switchover to gas heating at temperatures below ~37F.

Calculate Building Energy Use for the base code and section 406 options: The base code (prescriptive) changes made in 2018 and by the 2021 IECC additions, are first assessed to determine the base energy

use of the prototype buildings. This ultimately impacts the credits awarded by Section R406 options. Baseline envelope options improve the stringency of the code by roughly 8%.

After the new base code energy use is established, the value of each credit is reassessed and if needed, reassigned. While this analysis is focused on the relative savings and cost of Section R406, the savings attributed to prescriptive 2021 IECC measures are not 'lost' in the analysis however, as the energy savings is now reflected in the 2021 baseline (prescriptive) energy use of the residential sector.

Assess the number of credits required to achieve the objectives of RCW 19.27a.160: This proposal is designed to meet the high-level goal of RCW 19.27a.160. This 2021 Section R406 code change proposal, along with prescriptive updates, is expected to lead a 10% energy reduction over a 2018 WSEC compliant home.

Adjust the targets for systems analysis approach, section 405.3: The last step is to assess the performance-based approach. The targets under this section have been reduced by an additional 9% over the 2018 prescriptive code requirements. This accounts for both the required increase in efficiency and the somewhat lower energy use baseline.

Energy Savings Estimates

Energy savings estimates used in the life cycle cost analysis were developed using SEEM. The SEEM energy simulation program was used to develop the energy savings targets and estimates for the 2009-2018 iterations of the residential portion of Washington State Energy Code. SEEM is used by the Northwest Power and Conservation Council RTF to estimate savings for most of the regional utility conservation programs. The modeling protocol is intended to represent the wide variety of new homes constructed in Washington, to summarize the average savings that can be attributed to each option listed in Table R406.3 and estimate the overall consumption of the residential sector for each code cycle.

The SEEM program is designed to model small scale residential building energy use. The program consists of an hourly thermal simulation and an hourly moisture (humidity) simulation that interacts with duct specifications, equipment, and weather parameters to calculate the annual heating and cooling energy requirements of the home. It is based on algorithms consistent with current American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE), American Heating and Refrigeration Institute (AHRI), and International Organization for Standards (ISO) calculation standards. In order for the SEEM model to be used in efficiency measure assessments, it must be calibrated to baseline and efficient-case consumption. Calibration for single family, multi-family, and manufactured homes are separate endeavors that utilize metered data from a sample of homes in the NW to estimate energy consumption. SEEM was recalibrated in response to findings from the 2011 Residential Building Stock Assessment. This provides calibrated results for Pacific NW homes.

For single family construction, the energy model is built using six RTF-approved prototype designs, including: a 1344 sf rambler (both on a slab and over a crawlspace), 2200 sf rambler (both on a slab and over a crawlspace), 2688 with half basement and 5000 sf full basement home. These six prototypes are then modeled with the three primary heating system types ("gas home", "Heat Pump Home" and "Electric Resistance Home") and then simulated in the two major climate zones in the state. Each energy conservation measure (option in Table R406.3) is then modeled independently in each of these scenarios, with the energy savings weighted down to a representative credit value shown in Table R406.3.

For low-rise multifamily construction, the same method was used as for single family 3. The presumed predominant construction-types are a 2-story, garden style (exterior entry) building and a 3-story

'double loaded corridor' building. The annual energy use, utility savings, and incremental cost were then normalized to a per unit basis.

After individual measures were modeled independently and associated savings determined, each prototype summarized in this LCCA analysis was modeled with a selection (package) of R406 options required to be code compliant (both in 2018 and 2021). This important step not only illustrated the code-to-code savings, but it also accounts for interaction between different credit options within the table. As more measures are utilized in a home, more interaction occurs between measures, and the individual savings attributed to that measure are not realized when paired with a host of other options. For instance, higher envelope insulation will de-rate the savings available from increased equipment efficiencies. It is important to capture this interaction through the modeling exercise or else the anticipated savings estimates will be overinflated. It is the annual energy savings obtained from these packages of measures that are used in determining the life cycle cost of the code change proposal.

First Cost method:

First cost and energy savings estimates have been developed using an estimating procedure used by the Northwest Power and Conservation Council (NPCC) and ran through the Office of Financial Management Life Cycle Cost Tool. The first costs were developed using multiple sources of information:

- NPCC, the Regional Technical Forum (RTF), http://rtf.nwcouncil.org/ This is a federally mandated multi-state compact that develops the efficiency resources for the region's electric utilities
- Navigant is a business consulting firm which provides resource planning for both gas and electric utilities, including gas utilities in Washington State. http://www.navigant.com/industries/energy/
- CEE is the Consortium for Energy Efficiency. CEE is the US and Canadian consortium of gas and electric efficiency program administrators. http://www.cee1.org/
- This study also uses cost information provided to the SBCC by Ecotope
- PassiveHouse consultant aided with pricing the higher insulation and envelope detailing
- Inflation has been accounted for all historical cost estimates

All costs shown are incremental costs for each measure, the base cost is related to the prescriptive requirement of the code and the incremental costs are associated with the option requirement of Table R406.2. Keeping this in mind, the incremental cost for a ductless minisplit, in single family, is the added equipment cost associated with purchasing a higher efficiency heat pump (since DHPs are required in the prescriptive code in electric zonal single-family homes); while in multifamily, the incremental cost of a heat pump is higher because it is compared to electric baseboards. Water heating systems in multifamily are assumed to serve more than one unit, therefore their incremental costs are lower than for single family.

The cost analyses provided in this report use a weighted average cost method to represent the wide range of new homes constructed in Washington. Each of the predominant dwellings, as defined in Section R406.2, are shown in the LCCA case studies (large dwelling units represent a minor fraction of the overall building stock, therefore were omitted from the analysis). For each single-family dwelling unit size, the predominant heating system types are shown individually ("Gas Home", "Heat Pump Home" and "Electric Zonal Home") in order to show cost effectiveness for all available heating system types. The cost model is built using the five prototype designs, including a 1344 sf rambler (both on a slab and over a crawlspace), 2200 sf rambler (both on a slab and over a crawlspace), 2688 with half basement. The costs associated with the crawl space and slab prototypes were normalized into each of the dwelling unit sizes per Section R406.2. Multifamily costs were based on an electric zonal heating system. A first cost estimate is developed for each option and for each prototype. Then, the incremental

cost of each prototype is weighted by the expected construction volumes to provide an overall average measure cost. The tables, Incremental Cost of Single Family Options and Incremental Cost of MF Options, provides both prototype and weighted measure cost.

Unlike the energy savings estimates, the first cost numbers are a fixed value for each energy measure and do not change based on the selected package of measures modeled for the LCCA. This assumes that incremental costs of each option do not have the any interdependency – contrary to the associated energy savings, as stated earlier. This will no longer be the case as buildings become more efficient. Higher levels of envelope insulation and tighter construction leads to smaller HVAC systems, and therefore a cost credit should be applied. But as mentioned, this approach was not applied in this analysis.

Energy and Cost Summary Tables:

Table 1: Incremental Cost of Single Family options, by home size
Incremental Cost of Single Family Options

						Prot	otyp	es Weight %	by F	loor Ar	ea	
					8	1344		2200	2	2688		5000
			25.55	eighted								
			N	leasure								
Option-Description	Gas Credit Value	HP Credit Value		Cost		15%		72%		11%		2%
1.1 - U24 Glaze	0.5	0.5	\$	1,730	\$	991	\$	1,790	\$	1,987	\$	3,688
1.2 - U20 Glaze	1	1	\$	2,537	\$	1,454	\$	2,625	\$	2,914	\$	5,409
1.3 - 5% UA reduc	0.5	0.5	\$	1,261	\$	955	\$	1,270	\$	1,762	\$	476
1.4 - 15% UA reduc	1	1	\$	3,263	\$	1,925	\$	3,255	\$	4,676	\$	5,802
1.5 - 22.5% UA reduc	2	1.5	\$	4,721	\$	2,938	\$	4,850	\$	5,735	\$	7,852
1.6 - 30% UA reduc	3	2.5	\$	11,235	\$	6,819	\$	12,095	\$1	10,587	\$	16,991
2.1 - 2 ACH, HRV	1	0.5	\$	2,264	\$	1,395	\$	2,284	\$	2,790	\$	5,190
2.2 - 1.5 ACH, HRV	1.5	1	\$	5,411	\$	3,334	\$	5,457	\$	6,667	\$	12,402
2.3 - 0.6 ACH, HRV	2	1.5	\$	6,988	\$	4,306	\$	7,048	\$	8,612	\$	16,019
3.1a - Furnace	1	1	\$	252	\$	252	\$	252	\$	252	\$	252
3.2a - 9.5 HSPF HP	0.5	0.5	\$	1,388	\$	1,388	\$	1,388	\$	1,388	\$	1,388
3.3a - GSHP	1.5	1.5	\$	11,034	\$	10,900	\$	10,900	\$1	10,900	\$	17,600
3.4 - DHP	1.5	1.5	\$	1,530	\$	1,530	\$	1,530	\$	1,530	\$	1,530
3.5a - 11.0 HSPF HP	1	1	\$	1,530	\$	1,530	\$	1,530	\$	1,530	\$	1,530
3.6a - DHP (15% elec)	2	2	\$	5,901	\$	5,901	\$	5,901	\$	5,901	\$	5,901
4.1 - Deeply buried	1	0.5	\$	-	\$	a	\$	ie .	\$	101	\$	
4.2 - HVAC inside	1.5	1	\$	328	\$	328	\$	328	\$	328	\$	328
5.1 - DWR	0.5	0.5	\$	437	\$	437	\$	437	\$	437	\$	437
5.2 - 0.80 gas DHW	0.5	0.5	\$	640	\$	640	\$	640	\$	640	\$	640
5.3 - 0.91 gas DHW, GSHP	1	1	\$	1,009	\$	1,009	\$	1,009	\$	1,009	\$	1,009
5.4 - Tier III HPWH	2	2	\$	955	\$	955	\$	955	\$	955	\$	955
5.5 - CO2 HPWH	2.5	2.5	\$	3,824	\$	3,824	\$	3,824	\$	3,824	\$	3,824
6.1 - Solar pV	1	1	\$	5,040	\$	5,040	\$	5,040	\$	5,040	\$	5,040
7.1 - ES Appl+ventless Dryer	0.5	0.5	\$	505	\$	505	\$	505	\$	505	\$	505

Table 2: Modeled Energy Savings - Single Family, by home size and heating system type

			S			MF			
	gfac	gfac	ashp	zonl	gfac	gfac	ashp	zonl	zonl
Options Table 2021	kWh	Therm	kWh	kWh	kWh	Therm	kWh	kWh	kWh
mandatory req's	0	0	0	0	0	0	0	0	0
windows U=0.24	114	5	1143	173	292	5	302	348	132
windows U=0.2	160	12	1192	291	369	18	492	597	263
envelope 3 - 5% UA	18	0	1101	94	-70	-2	59	122	-34
envelope 4 - 15% UA	151	24	1243	406	288	28	528	648	223
envelope 5 - 22.5% UA	303	33	1315	581	577	41	817	1015	420
envelope 6 - 30%UA	348	55	1430	821	887	69	1158	1456	555
air leakage 1 hrv	-116	3	1059	-10	-271	19	105	111	329
air leakage 2 hrv	4	45	283	344	87	67	504	664	642
air leakage 3 hrv	91	54	414	487	530	78	762	997	934
AFUE .95	-84	34	-	-	55	51	-	-	
HSPF 9.5	-	-	248	-	-	-	328	-	
DHP HSPF 10(zonal only)	-	-	-	689	-	-	-	1129	-41
HSPF 11	-	-	371	-	-	-	980	-	
DHP HSPF 10 whole house (zonal only)	-	-	-	1154	-	-	-	2185	740
ducts inside	356	32	385	-	781	38	666	-	
drain water heat recovery	76	23	260	247	-55	33	282	318	182
dwh gas UEF 0.80	18	27	-	-	3	34	-	-	
dwh gas UEF 0.91	-28	39	-	-	12	48	-	-	
hpwh Tier III	-930	121	1407	1395	-1167	153	1761	1790	973
UEF 2.9	-813	121	1536	1512	-1099	156	1916	1941	1055
Energy Star appliances	722		824	784	625		750	776	629

Table 3: Incremental Cost of Multifamily options and Modeled Energy Savings (Zonal Electric only)

	only)	
		Measure
Option-Description	Credit Value	Cost
1.1 - U24 Glaze	0.5	
1.2 - U20 Glaze	1	\$ 887
1.3 - 5% UA reduc		\$ 173
1.4 - 15% UA reduc	1	\$ 947
1.5 - 22.5% UA reduc	1.5	\$ 1,383
1.6 - 30% UA reduc	2	\$ 3,779
2.1 - 2 ACH, HRV	0.5	\$ 851
2.2 - 1.5 ACH, HRV	1	\$ 2,034
2.3 - 0.6 ACH, HRV	1.5	\$ 2,627
3.1a - Furnace	1	\$ 252
3.2a - 9.5 HSPF HP		
3.3a - GSHP	1	
3.4 - DHP	2	\$ 3,060
3.5a - 11.0 HSPF HP		\$ -
3.6a - DHP (15% elec)	3	\$ 5,245
4.1 - Deeply buried	0.5	\$ -
4.2 - HVAC inside		
5.1 - DWR		\$ 505
5.2 - 0.80 gas DHW	0.5	
5.3 - 0.91 gas DHW, GSHP	1	
5.4 - Tier III HPWH	2.5	\$ 318
5.5 - CO2 HPWH	3	\$ 1,275
6.1 - Solar pV	1	\$ 5,040
7.1 - ES Appl+ventless Dryer	1.5	\$ 505

Life Cycle Cost Analysis

Life Cycle Cost Analysis (LCCA) is an analytical technique capable of comparing the present value of upfront capital cost to future operational costs. LCCA helps decision makers determine which project designs are likely to deliver the lowest total Life Cycle Cost (LCC).

The State Building Code Council has adopted the use of Washington State Department of Financial Managements (OFM) life cycle cost tool for this analysis. The OFM life cycle cost tool used to provide these results is based on the methodology of National Institute of Standards, HANDBOOK 135 Life-Cycle Costing Manual. The OFM model is designed for state projects and commercial construction. This model was modified to support residential construction. This primarily required changing the fuel escalation rates from commercial to a residential standard.

Standard inputs for Life cycle cost on all the submitted documents are included in the table below.

Key Variables	● OFM	O User	Value			
Building Life	50	50	50			
Real Discount Rate	0.70%	70.00%	0.70%			
Standard Maintenance Escalation	1.00%	1.00%	1.00%			
General Inflation	2.42%	2.42%	2.42%			
Study Period (years) 50 50 50						
Fuel Escalation Assumptions Located on Fuel Escalation Page						

Timing Variables	Year(s)	
Base Year (Generally Current Year)	2022	
Additional Construction Years beyond 2022	0	1st Operation Year = 2023

Finance 1st Purchases for ->	aseline	Alt. 1	☐ Alt. 2
Down Payment (%)	20%	20%	20%
Term (Years)	25	25	25
Nominal Interest Rate	3.14%	3.14%	3.14%
Real Interest Rate	0.70%	0.70%	0.70%

Life Cycle Cost Reports

Below are the results of life cycle cost calculations for 5 of the 6 single family prototype buildings, each with a central heat pump, gas furnace, and zonal electric as well as the multifamily prototype with zonal electric heat. Each prototype includes 5 pages of report.

Executive report: This page summarizes the total life cycle cost results for three alternatives based on a 50-year life cycle cost assessment.

Baseline: The baseline report describes the life cycle cost impact for a 2018 WSEC compliant structure. Each includes the number of credits that would be required to meet the 2018 WSEC.

Alt 1. This report provides the inputs for the 2021 WSEC proposal. The cost and benefits included reflect the information detailed in this report.

Alt 2. This report is identical to Alt1, except \$0.75 per square foot of floor area is added to the cost. This provides a buffer to cover uncertainty about the first cost assessment.

Expenditure Report. We have included the results of the expenditure report for each project. This allows the reader to view the year over year cash flow for each model.

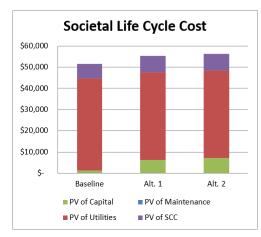
Small Gas Home – Executive Report

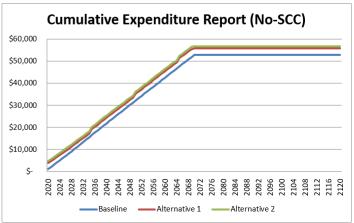
Key Analysis Var	riables	Building Ch	aracteristics
Study Period (years)	50	Gross (Sq.Ft)	1,344
Nominal Discount Rate	3.14%	Useable (Sq.Ft)	1,344
Maintenance Escalation	1.00%	Space Efficiency	100.0%
Zero Year (Current Year)	2020	Project Phase	0
Construction Years	0	Building Type	0

Life Cycle Cost Analysis	BEST		
Alternative	Baseline	Alt. 1	Alt. 2
Energy Use Intenstity (kBtu/sq.ft)	35.7	36.5	36.5
1st Construction Costs	\$ 1,207	\$ 3,895	\$ 4,903
PV of Capital Costs	\$ 1,207	\$ 6,156	\$ 7,099
PV of Maintenance Costs	\$ -	\$ -	\$ -
PV of Utility Costs	\$ 43,408	\$ 41,254	\$ 41,254
Total Life Cycle Cost (LCC)	\$ 44,615	\$ 47,410	\$ 48,354
Net Present Savings (NPS)	N/A	\$ (2,796)	\$ (3,739)

Societal LCC takes into consideration the social cost of carbon dioxide emissions caused by operational energy consumption

(GHG) Social Life Cycle Cost	BEST		
GHG Impact from Utility Consumption	Baseline	Alt. 1	Alt. 2
Tons of CO2e over Study Period	83	93	93
% CO2e Reduction vs. Baseline	N/A	-13%	-11%
Present Social Cost of Carbon (SCC)	\$ 6,828	\$ 7,784	\$ 7,784
Total LCC with SCC	\$ 51,442	\$ 55,195	\$ 56,138
NPS with SCC	N/A	\$ (3,753)	\$ (4,696)





Small Gas Home – Baseline Input

Open Primary Filter and Click OK to Re-filter

<-	Primary Fil	lter (Requires Level 1)		Open Prim	ary Filter	and Click OK to Re-filter						
	Office	of Financial Management		✓ Show I	All Entere	d Units (Requires Re-Filter))					
		oia, Washington - Version: 2020-A cycle Cost Analysis Tool										
		eline Input Page			Total E	uilding Annual Utility An	alysis	\$	957	Water (CCF)	Electricity (KWH)	Natural Gas (Therms)
						Annual Utility E	Bill [\$]			(==: /	\$ 752	
					А	nnual Utility Consumption	Not Entered Below	/			8,352	195
						Sum of Annual Utility Con				-	-	-
						Total Annual Utility C				-	8,352	195
	1		+	•	•	Annual Utility Bill ÷ Total Ut				\$ -	\$ 0.09	
S	U	niformat II Elemental Classification for			Useful	Installed Cost	1st Year	Total Con		Annual	Annual Electricity	Annual
Н		Buildings (Building Component List)	REF	# of Units	Life	(\$/Unit)	Maintenance	Installe		Water (CCF/Unit)		Natural Gas
W		, , , ,			(Yrs.)		Cost (\$/Unit)	(\$'	s)			(Therm/Unit)
		Primary Entries Below: # of Units must	be > 0 t	to be counte	d; Useful	Life must be >= 2	,	\$	1,207	Entries Belo	w for Component	Specific Utility Ana
		Ibstructure										
		nell						-				
		teriors ervices										
_		rrvices quipment & Furnishings										
_		pecial Construction & Demolition										
	, -p	uilding Sitework										
×		Building Envelope										
×	X901001		0.5		50	\$991.30					-114	-5
×			1		50	\$1,453.90					-160	-12
x	X901003		0.5		50	\$955.15					-18	0
×	X901004	1.4 - 15% UA reduc	1		50	\$1,925.40					-151	-24
×	X901005	1.5 - 22.5% UA reduc	2		50	\$2,937.75					-303	-33
×	X901006		3		50	\$6,819.02					-348	-55
×			1		50	\$1,395.16					116	-3
×			1.5		50	\$3,333.70					-4	-45
-	X901009		2		50	\$4,305.90					-91	-54
×		HVAC	-									
	X902001		1		18	\$251.59					84	-34
X	X902002 X902003		0.5		15 20	\$1,387.73 \$10,900.00						
×			1.5		18	\$1,529.78						
×	X902005		1.3		15	\$1,529.78						
×	_		2		18	\$5,900.58						
×	X902007		1		50	\$0.00						
X	X902008		1.5		50	\$327.81					-356	-32
X	X9030	Hot Water										
×			0.5		50	\$437.08					-76	-23
×			0.5		15	\$640.32					-18	-27
×	X903003		1		15	\$1,008.56					28	-39
X			2		15	\$955.02		_				
X	X903005 X9040	5.5 - CO2 HPWH Other	2.5		15	\$3,824.45						
×			1		25	\$5,040.00						
×	_		0.5		15	\$5,040.00					-722	
×	_	2018 Compliant Building Cost	0.3	1	50	\$1,206.61		\$	1,207		-122	
×	X9060	Added Cost			55	\$0.75		Ť	1,201			
	X9070	3ACH & Continuous Insulation			50	\$1,405.00						
		ther Project Costs										
		ne Time - Upfront Costs		1	50							
	Z30 Re	e-Occurring Annual Cost (Track Inflation)		1	1							

Small Gas Home – ALT 1

<- P	rimar	y Filter (Requires Level 1)		Open Prim	ary Filter	and Click OK to Re-filter							
151150		ce of Financial Management				Selection Only (Requires R	efilter)			1			
		mpia, Washington - Version: 2020-A				ields and Entered Units (R							
	-	Cycle Cost Analysis Tool				es Between Alternative and	•	ofiltor)		-			
		ternative 1 Input Page		O SHOW L		uilding Annual Utility An	•	S	887	Water	Electricity (KWH)	Natural Gas	
	All	iciliative i iliputi age				The state of the s		,		(CCF)		(Therms)	
						Annual Utility E					\$ 619	\$ 268	
					Aı	nnual Utility Consumption		V			7,166	321	
						Sum of Annual Utility Con					(291)	(66)	
						Total Annual Utility Co Innual Utility Bill ÷ Total Ut				S -	6,876 \$ 0.09	\$ 1.05	
	Note	: No Units Assigned to a Component with Entries			,	annual ounity bill + Total ot	ility Consumption			\$ -	3 0.09	\$ 1.05	
	11010	. No onito Assigned to a component with Entires											
S		Uniformat II Elemental Classification for			Useful	Installed Cost	1st Year		omponent	Annual	Annual Electricity	Annual	
Н		Buildings (Building Component List)	REF	# of Units	Life	(\$/Unit)	Maintenance		led Cost	Water (CCF/Unit)		Natural Gas	
w		Banangs (Banang Compenent Liet)			(Yrs.)		Cost (\$/Unit)	(\$'s)			(Therm/Unit)	
		Primary Entries Below: # of Unit	ts mus	t be > 0 to b	e counte	d; Useful Life must be >= 2		100		Entries Belo	w for Component	Specific Utility Ana	
		n Baseline: Filter to Select All & Drag Copy 014:S14 & U14:AG14						\$	3,895				
	Α	Substructure											
-	В	Shell											
-	С	Interiors											
	D	Services											
	E	Equipment & Furnishings											
-	F	Special Construction & Demolition			4								
	G	Building Sitework											
	X901												
	X901	A 100	0.5		50	\$991					-114	-5	
	X901		1		50	\$1,454					-160	-12	
	X901		0.5	1		\$955		\$	955		-18	0	
	X901		1		50	\$1,925					-151	-24	
	X901		2		50	\$2,938					-303	-33	
	X901		3		50	\$6,819	×				-348	-55	
	X901		1		50	\$1,395					116	-3	
	X901		1.5		50	\$3,334		6 8			-4	-45	
	X901		2		50	\$4,306					-91	-54	
_	X902					4050			252				
_	X902		0.5	1		\$252		\$	252		84	-34	
	X902		0.5		15 20	\$1,388		_			-		
	X902		1.5		18	\$10,900		200					
	X902 X902		1.5		15	\$1,530 \$1,530							
	X902		2		18	\$5,901							
	X902		1		50	\$3,501		12					
	X902		1.5	1		\$328		\$	328		-356	-32	
	X903		1.3	1	30	-		,	328		-550	-52	
	X903		0.5		50	\$437					-76	-23	
	X903		0.5		15	\$640					-18	-27	
	X903		1		15	\$1,009					28	-39	
	X903		2	1		\$955		\$	955				
	X903		2.5		15	\$3,824		7					
	X904					, =/==							
	X904		1		25	\$5,040							
	X904		0.5		15	\$505					-722		
	X905				50	\$1,207							
	X906	1 0			55	\$0.75							
	X907			1	50	\$1,405		\$	1,405				
	Z	Other Project Costs											
	Z10	One Time - Upfront Costs		1	50								
	Z30	Re-Occurring Annual Cost (Track Inflation)		1	1								

Small Gas Home – ALT 2

- FI	rimary	Filter	(Requires Level 1)		Open Prima	ary Filter	and Click OK to Re-filter							
	Offic	ce of	Financial Management		O Manua	Special S	selection Only (Requires R	efilter)			1			
			Washington - Version: 2020-A		Show B	aseline F	ields and Entered Units (R	equires Refilter)						
		1/83	le Cost Analysis Tool				s Between Alternative and		ofiltor)					
			ative 2 Input Page		O SHOW E		uilding Annual Utility An		\$	887	Water (CCF)	Electricity (K	WH)	Natural Gas (Therms)
							Annual Utility E	Rill [\$1			(ccr)	Ś	619	
						Δr	nual Utility Consumption		M				,166	
							Sum of Annual Utility Con						(291)	(66)
							Total Annual Utility Co						,876	255
						А	nnual Utility Bill ÷ Total Ut		I).		\$ -		0.09	
	Note:	No U	nits Assigned to a Component with Entries			10 10		*	27				- 20	
S H O			ormat II Elemental Classification for ildings (Building Component List)	REF	# of Units	Useful Life (Yrs.)	Installed Cost (\$/Unit)	1st Year Maintenance Cost (\$/Unit)	Insta	Component alled Cost (\$'s)	Annual Water (CCF/Unit)	Annual Elect (KWH/Un		Annual Natural Gas (Therm/Unit)
W			Primary Entries Below: # of U	nite mue	t ha > 0 to he	countos	· Heaful Life must be >= 2	30000 000			Entries Bala	ow for Compo	nont 9	Specific Utility Ana
	Match	Baselin	e: Filter to Select All & Drag Copy 014:S14 & U14:AG14	nes mus	1 50 2 0 10 01	Countet	, Osciul Life must be 2= 2		Ś	4,903	Littles Belt	Tor compo	Hellice	pecific Othicy Aria
			ructure						Ť	,,,,,,,				
	500	Shell	with 5											
	_	Interio	nrs											
	-	Servic							1					
_	_	-							+			_		
-	_		ment & Furnishings										-	
			l Construction & Demolition	-					-			-		
			ng Sitework						-				-	
	X9010		ilding Envelope											
	X9010		1.1 - U24 Glaze	0.5		50	\$991					-114		-5
	X9010		1.2 - U20 Glaze	1		50	\$1,454					-160		-12
	X9010		1.3 - 5% UA reduc	0.5	1	50	\$955		\$	955		-18		0
	X9010		1.4 - 15% UA reduc	1		50	\$1,925					-151		-24
	X9010		1.5 - 22.5% UA reduc	2		50	\$2,938					-303		-33
	X9010	06	1.6 - 30% UA reduc	3		50	\$6,819					-348		-55
	X9010	107	2.1 - 2 ACH, HRV	1		50	\$1,395					116		-3
	X9010	80	2.2 - 1.5 ACH, HRV	1.5		50	\$3,334					-4		-45
	X9010	109	2.3 - 0.6 ACH, HRV	2		50	\$4,306					-91		-54
	X9020	HV	'AC	3										
	X9020	01	3.1a - Furnace	1	1	18	\$252		\$	252		84		-34
	X9020	102	3.2a - 9.5 HSPF HP	0.5		15	\$1,388							
	X9020	03	3.3a - GSHP	1.5		20	\$10,900							
	X9020	104	3.4 - DHP	1.5		18	\$1,530							
	X9020		3.5a - 11.0 HSPF HP	1		15	\$1,530							
	X9020		3.6a - DHP (15% elec)	2		18	\$5,901							
	X9020		4.1 - Deeply buried	1		50								
	X9020		4.2 - HVAC inside	1.5	1	50	\$328		\$	328		-356		-32
	X9030		t Water											
	X9030		5.1 - DWR	0.5		50	\$437					-76		-23
	X9030		5.2 - 0.80 gas DHW	0.5		15	\$640					-18		-27
	X9030		5.3 - 0.91 gas DHW, GSHP	1		15	\$1,009		1			28		-39
	X9030		5.4 - Tier III HPWH	2	1	15	\$955		\$	955				
	X9030		5.5 - CO2 HPWH	2.5	-	15	\$3.824		Ť	200				
	X9040			2.3		13	\$3,024							
	X9040	_	6.1 - Solar pV	1		25	\$5,040							
	X9040		7.1 - ES Appl+ventless Dryer	0.5		15	\$5,040		1			-722		
	X9040		18 Compliant Building Cost	0.5		50	\$1,207		+			-122		
	X9050		ded Cost		1344	55	\$1,207		\$	1.000				
	_	_								1,008				
	X9070		CH & Continuous Insulation		1	50	\$1,405		\$	1,405				
	_		Project Costs											
	Z10	One Ti	ime - Upfront Costs		1	50								

<u>Small Gas Home – Expenditure Report</u> **Expenditure Report Page In Constant 2020 \$'s**

	Cumulative	e Expenditur	e Su	ımmary	Annual E	xp	enditure :	Sui	mmary
Year	Baseline	Alt. 1		Alt. 2	Baseline		Alt. 1		Alt. 2
2020	\$ 1,207	\$ 3,895	\$	4,903	\$ 1,207	\$	3,895	\$	4,903
2021	\$ 2,171	\$ 4,788	\$	5,796	\$ 965	\$	893	\$	893
2022	\$ 3,136	\$ 5,681	\$	6,689	\$ 965	\$	893	\$	893
2023	\$ 4,110	\$ 6,584	\$	7,592	\$ 975	\$	902	\$	902
2024	\$ 5,089	\$ 7,491	\$	8,499	\$ 979	\$	908	\$	908
2025	\$ 6,089	\$ 8,420	\$	9,428	\$ 1,000	\$	929	\$	929
2026	\$ 7,109	\$ 9,367	\$	10,375	\$ 1,020	\$	947	\$	947
2027	\$ 8,134	\$ 10,319	\$	11,327	\$ 1,024	\$	952	\$	952
2028	\$ 9,160	\$ 11,274	\$	12,282	\$ 1,026	\$	955	\$	955
2029	\$ 10,188	\$ 12,231	\$	13,239	\$ 1,028	\$	957	\$	957
2030	\$ 11,238	\$ 13,217	\$	14,225	\$ 1,051	\$	987	\$	987
2031	\$ 12,303	\$ 14,218	\$	15,226	\$ 1,064	\$	1,001	\$	1,001
2032	\$ 13,359	\$ 15,213	\$	16,221	\$ 1,057	\$	995	\$	995
2033	\$ 14,420	\$ 16,213	\$	17,221	\$ 1,061	\$	1,000	\$	1,000
2034	\$ 15,485	\$ 17,218	\$	18,226	\$ 1,065	\$	1,005	\$	1,005
2035	\$ 16,550	\$ 19,178	\$	20,186	\$ 1,065	\$	1,960	\$	1,960
2036	\$ 17,609	\$ 20,180	\$	21,188	\$ 1,059	\$	1,001	\$	1,001
2037	\$ 18,668	\$ 21,181	\$	22,189	\$ 1,059	\$	1,001	\$	1,001
2038	\$ 19,721	\$ 22,430	\$	23,438	\$ 1,053	\$	1,249	\$	1,249
2039	\$ 20,776	\$ 23,430	\$	24,438	\$ 1,055	\$	1,000	\$	1,000
2040	\$ 21,823	\$ 24,424	\$	25,432	\$ 1,047	\$	994	\$	994
2041	\$ 22,873	\$ 25,421	\$	26,429	\$ 1,049	\$	996	\$	996
2042	\$ 23,914	\$ 26,411	\$	27,419	\$ 1,042	\$	990	\$	990
2043	\$ 24,958	\$ 27,403	\$	28,411	\$ 1,044	\$	993	\$	993
2044	\$ 25,993	\$ 28,389	\$	29,397	\$ 1,036	\$	986	\$	986
2045	\$ 27,031	\$ 29,378	\$	30,386	\$ 1,038	\$	989	\$	989
2046	\$ 28,071	\$ 30,370	\$	31,378	\$ 1,040	\$	992	\$	992
2047	\$ 29,113	\$ 31,364	\$	32,372	\$ 1,042	\$	994	\$	994
2048	\$ 30,147	\$ 32,352	\$	33,360	\$ 1,034	\$	988	\$	988
2049	\$ 31,183	\$ 33,342	\$	34,350	\$ 1,036	\$	990	\$	990
2050	\$ 32,213	\$ 35,284	\$	36,292	\$ 1,030	\$	1,942	\$	1,942
2051	\$ 33,244	\$ 36,271	\$	37,279	\$ 1,030	\$	987	\$	987
2052	\$ 34,274	\$ 37,259	\$	38,267	\$ 1,030	\$	988	\$	988
2053	\$ 35,304	\$ 38,248	\$	39,256	\$ 1,030	\$	989	\$	989
2054	\$ 36,335	\$ 39,238	\$	40,246	\$ 1,030	\$	990	\$	990
2055	\$ 37,365	\$ 40,229	\$	41,237	\$ 1,031	\$	991	\$	991
2056	\$ 38,396	\$ 41,472	\$	42,480	\$ 1,031	\$	1,243	\$	1,243
2057	\$ 39,427	\$ 42,465	\$	43,473	\$ 1,031	\$	992	\$	992
2058	\$ 40,457	\$ 43,458	\$	44,466	\$ 1,031	\$	993	\$	993
2059	\$ 41,488	\$ 44,452	\$	45,460	\$ 1,031	\$	994	\$	994
2060	\$ 42,519	\$ 45,447	\$	46,455	\$ 1,031	\$	995	\$	995
2061	\$ 43,550	\$ 46,443	\$	47,451	\$ 1,031	\$	996	\$	996
2062	\$ 44,581	\$ 47,439	\$	48,447	\$ 1,031	\$	997	\$	997
2063	\$ 45,612	\$ 48,437	\$	49,445	\$ 1,031	\$	997	\$	997
2064	\$ 46,643	\$ 49,435	\$	50,443	\$ 1,031	\$	998	\$	998
2065	\$ 47,674	\$ 51,389	\$	52,397	\$ 1,031	\$	1,954	\$	1,954
2066	\$ 48,705	\$ 52,389	\$	53,397	\$ 1,031	\$	1,000	\$	1,000
2067	\$ 49,736	\$ 53,390	\$	54,398	\$ 1,031	\$	1,001	\$	1,001
2068	\$ 50,768	\$ 54,391	\$	55,399	\$ 1,031	\$	1,002	\$	1,002
2069	\$ 51,799	\$ 55,394	\$	56,402	\$ 1,031	\$	1,002	\$	1,002
2070	\$ 52,831	\$ 55,704	\$	56,621	\$ 1,031	\$	311	\$	219

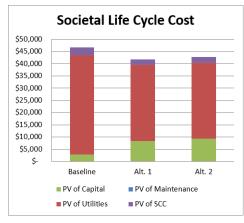
Small Heat Pump Home – Executive Report

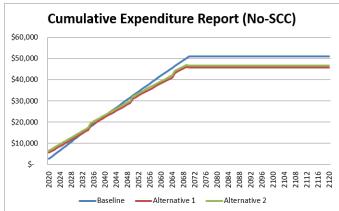
Key Analysis V	ariables	Building Ch	aracteristics
Study Period (years)	50	Gross (Sq.Ft)	1,344
Nominal Discount Rate	3.14%	Useable (Sq.Ft)	1,344
Maintenance Escalation	1.00%	Space Efficiency	100.0%
Zero Year (Current Year)	2020	Project Phase	0
Construction Years	0	Building Type	0

Life Cycle Cost Analysis	BEST								
Alternative	Baseline		Alt. 1		Alt. 2				
Energy Use Intenstity (kBtu/sq.ft)	27.0		20.6		20.6				
1st Construction Costs	\$ 2,783	\$	5,642	\$	6,650				
PV of Capital Costs	\$ 2,783	\$	8,378	\$	9,322				
PV of Maintenance Costs	\$ -	\$	-	\$	-				
PV of Utility Costs	\$ 40,807	\$	31,127	\$	31,127				
Total Life Cycle Cost (LCC)	\$ 43,590	\$	39,506	\$	40,449				
Net Present Savings (NPS)	N/A	\$	4,084	\$	3,140				

Societal LCC takes into consideration the social cost of carbon dioxide emissions caused by operational energy consumption

(GHG) Social Life Cycle Cost	BEST								
GHG Impact from Utility Consumption	Baseline		Alt. 1		Alt. 2				
Tons of CO2e over Study Period	39		30		30				
% CO2e Reduction vs. Baseline	N/A		24%		31%				
Present Social Cost of Carbon (SCC)	\$ 2,998	\$	2,287	\$	2,287				
Total LCC with SCC	\$ 46,588	\$	41,793	\$	42,736				
NPS with SCC	N/A	\$	4,795	\$	3,852				





<u>Small Heat Pump Home – Baseline Input</u>

Primar	ry Filter (Requires Level 1)		Onen Brim	any Eilter	and Click OK to Re-filter			٠,			
	ice of Financial Management				Units (Requires Re-Filter)	1			1		
			9 3110W F	All Litteret	Torits (Requires Re-Filter))]		
	/mpia, Washington - Version: 2020-A e Cycle Cost Analysis Tool								10000000		
	aseline Input Page			Total B	uilding Annual Utility An	alveie	\$	959	Water	Electricity (KWH)	Natural Gas
D	aseille iliput rage			Total D			1	- 333	(CCF)		(Therms)
					Annual Utility E					\$ 959	\$ -
					nnual Utility Consumption Sum of Annual Utility Con		/			10,654	
					Total Annual Utility Con				-	10,654	
				Δ	nnual Utility Bill ÷ Total Ut				\$ -	\$ 0.09	\$ -
			•	1	,		Tarabo	mponent	*	Ţ 0.00	
	Uniformat II Elemental Classification for	REF	# of Units	Useful Life	Installed Cost	1st Year Maintenance		mponent ed Cost	Annual	Annual Electricity	Annual Natural Gas
	Buildings (Building Component List)	KEF	# OF OTHES	(Yrs.)	(\$/Unit)	Cost (\$/Unit)		's)	Water (CCF/Unit)	(KWH/Unit)	(Therm/Unit)
/						Cost (5) offic		•			
	Primary Entries Below: # of Units mus	t be > 0 t	o be counte	d; Useful I	Life must be >= 2		\$	2,783	Entries Belo	w for Component	Specific Utility An
A	Substructure						_				
В	Shell										
С	Interiors										
D E	Services										
F	Equipment & Furnishings Special Construction & Demolition										
G	Building Sitework										
X901											
X901		0.5		50	\$991.30					-1.143	
X901		1		50	\$1,453.90					-1,192	
X901		0.5		50	\$955.15					-1,101	
X901		1		50	\$1,925.40					-1,243	
X901		1.5		50	\$2,937.75					-1,315	
X901		2.5		50	\$6,819.02					-1,430	
X901		0.5		50	\$1,395.16					-1,059	
X901		1		50	\$3,333.70					-283	
X901	1009 2.3 - 0.6 ACH, HRV	1.5		50	\$4,305.90					-414	
X902	20 HVAC										
X902		1		18	\$251.59						
X902		0.5		15	\$1,387.73					-248	
X902		1.5		20	\$10,900.00						
X902		1.5		18	\$1,529.78		_			074	
X902		1		15	\$1,529.78					-371	
X902		0.5		18 50	\$5,900.58		_				
X902		1		50	\$0.00 \$327.81					-385	
X902		1		30	\$327.01					-363	
X903		0.5		50	\$437.08					-260	
X903		0.5		15	\$640.32					200	
X903		1		15	\$1,008.56						
X903		2		15	\$955.02					-1,407	
X903	3005 5.5 - CO2 HPWH	2.5		15	\$3,824.45					-1,536	
X904	40 Other										
X904		1		25	\$5,040.00						
X904		0.5		15	\$504.83					-824	
X905			1	50	\$2,782.89		\$	2,783			
X906				55	\$0.75		_				
X907				50	\$1,405.00						
Z	Other Project Costs										
Z10 Z30	One Time - Upfront Costs Re-Occurring Annual Cost (Track Inflation)		1	50							

Small Heat Pump Home – ALT 1

Primary Filter (Red	TO 18 COMMO			- American	and Click OK to Re-filter						
Office of Fi	nancial Management		O Manua	Special S	Selection Only (Requires Re		I				
	/ashington - Version: 2020-A		Show F	Baseline F	ields and Entered Units (Re	equires Refilter)					
	Cost Analysis Tool	1			es Between Alternative and		ofiltor)		-		
150	tive 1 Input Page		O SHOW L		uilding Annual Utility Ana	731	Water	Electricity (KWH)	Natural Gas		
Alternat	ive i input i age			10,000,000		(CCF)		(Therms)			
		2			Annual Utility B	100 700				\$ 731	
					nnual Utility Consumption		V			10,626	
					Sum of Annual Utility Cons Total Annual Utility Co					(2,499)	1
				۸	nnual Utility Bill ÷ Total Ut				\$ -	\$ 0.09	\$
Note: No Units	s Assigned to a Component with Entries				annual othicy bill . Total of	ncy consumption			,	\$ 0.05	ې
	nat II Elemental Classification for			Useful	Installed Cost	1st Year		omponent	Annual	Annual Electricity	Annual
Buildi	ings (Building Component List)	REF	# of Units	Life (Yrs.)	(\$/Unit)	Maintenance Cost (\$/Unit)		illed Cost (\$'s)	Water (CCF/Unit)		Natural Gas (Therm/Unit
	Primary Entries Below: # of Ur	nits mus	t be > 0 to be	e counted	l; Useful Life must be >= 2				Entries Belo	w for Component	Specific Utility /
	ilter to Select All & Drag Copy O14:S14 & U14:AG14						\$	5,642			
A Substruct	ure										
B Shell											
C Interiors											
D Services											
	nt & Furnishings										
	onstruction & Demolition										
G Building S											
	ng Envelope										
	U24 Glaze	0.5		50	\$991.30					-1143	
	- U20 Glaze	1	1		\$1,453.90		\$	1,454		-1192	
	- 5% UA reduc	0.5		50	\$955.15					-1101	
	- 15% UA reduc	1		50	\$1,925.40					-1243	
	- 22.5% UA reduc	2		50	\$2,937.75					-1315	
	- 30% UA reduc	3		50	\$6,819.02					-1430	
	- 2 ACH, HRV	1	1		\$1,395.16		\$	1,395		-1059	
	- 1.5 ACH, HRV	1.5		50	\$3,333.70					-283	
	- 0.6 ACH, HRV	2		50	\$4,305.90					-414	
X9020 HVAC											
	a - Furnace	1		18	\$251.59						
	a - 9.5 HSPF HP	0.5	1		\$1,387.73		\$	1,388		-248	
	a - GSHP	1.5		20	\$10,900.00						
	- DHP	1.5		18	\$1,529.78						
	a - 11.0 HSPF HP	1		15	\$1,529.78					-371	
	ia - DHP (15% elec)	2		18	\$5,900.58						
	- Deeply buried	1		50	6227.04					205	
	- HVAC inside	1.5		50	\$327.81					-385	
X9030 Hot W X903001 5.1	ater DWR	0.5		50	\$437.08					260	
	DWK 0.80 gas DHW	0.5		15	\$437.08					-260	
	- 0.80 gas DHW - 0.91 gas DHW, GSHP	0.5		15	\$1,008.56						
	- U.91 gas DHW, GSHP	2		15	\$1,008.56					-1407	
	- CO2 HPWH	2.5		15	\$3,824.45					-1536	
X9040 Other		2.5		15	\$3,624.43					-1330	
	- Solar pV	1		25	\$5,040.00						
	ES Appl+ventless Dryer	0.5		15	\$5,040.00					-824	
	Compliant Building Cost	0.3		50	\$2,782.89					-024	
X9060 Added				55	\$2,782.89						
	& Continuous Insulation		1		\$1,405.00		Ś	1,405			
	pject Costs		1	30	\$1,403.00		7	1,403			
	- Upfront Costs		1	50							
	ring Annual Cost (Track Inflation)		1	1							

Small Heat Pump Home – ALT 2

	CONTRACTOR IN				Van Volume D. and						
	nary Filter (Requires Level 1)	1			and Click OK to Re-filter	City V			1		
	Office of Financial Management		_		Selection Only (Requires R						
	lympia, Washington - Version: 2020-A				ields and Entered Units (R						
L	ife Cycle Cost Analysis Tool		O Show E	Difference	es Between Alternative and			v-			
F	Alternative 2 Input Page			Total B	uilding Annual Utility Ana	731	Water (CCF)	Electricity (KWH)	Natural Gas (Therms)		
					Annual Utility E	Bill [\$]	-1		()	\$ 731	
				Ar	nual Utility Consumption		N		-	\$ 10,626	\$ -
					Sum of Annual Utility Con	sumption Below			-	(2,499)	0.5
					Total Annual Utility Co				-	8,127	115
	N- U-th- 1			А	nnual Utility Bill ÷ Total Ut	ility Consumption	l:		\$ -	\$ 0.09	\$ -
N	ote: No Units Assigned to a Component with Entries	9	T				1				
s	Uniformat II Elemental Classification for			Useful	Installed Cost	1st Year		omponent	Annual	Annual Electricity	Annual
Н	Buildings (Building Component List)	REF	# of Units	Life	(\$/Unit)	Maintenance		alled Cost	Water (CCF/Unit)		Natural Gas
o w	buildings (building component List)			(Yrs.)	(\$\forms	Cost (\$/Unit)		(\$'s)	video (eer joine)	(KWII) OIIIC)	(Therm/Unit)
	Primary Entries Below: # of Un	its mus	t be > 0 to be	e countec	l; Useful Life must be >= 2				Entries Belo	w for Component	Specific Utility Anal
	atch Baseline: Filter to Select All & Drag Copy O14:S14 & U14:AG14						\$	6,650			
. A	Substructure										
В	Shell						_				
С	Interiors										
D	Services										
E	Equipment & Furnishings										
F	Special Construction & Demolition										
G	Building Sitework						_				
	9010 Building Envelope	0.5			Ć004 30		-			4443	
	901001 1.1 - U24 Glaze 901002 1.2 - U20 Glaze	0.5		50	\$991.30		c	1 45 4		-1143 -1192	
		0.5	1	50 50	\$1,453.90		\$	1,454		-1192	
	901003 1.3 - 5% UA reduc 901004 1.4 - 15% UA reduc	0.5		50	\$955.15 \$1,925.40		+			-1101	
	901004 1.4 - 15% OA Feduc 901005 1.5 - 22.5% UA reduc	1.5		50	\$2,937.75					-1315	
	901005 1.5 - 22.5% UA reduc 901006 1.6 - 30% UA reduc	2.5		50	\$6,819.02					-1430	
	901007 2.1 - 2 ACH, HRV	0.5	1		\$1,395.16	<u> </u>	Ś	1,395		-1059	
-	901008 2.2 - 1.5 ACH, HRV	1	-	50	\$3,333.70		1	1,333		-283	
	901009 2.3 - 0.6 ACH, HRV	1.5		50	\$4,305.90					-414	
	9020 HVAC				4.1,000.00					,-,	
	902001 3.1a - Furnace	1		18	\$251.59						
X	902002 3.2a - 9.5 HSPF HP	0.5	1	15	\$1,387.73		\$	1,388		-248	
X	902003 3.3a - GSHP	1.5		20	\$10,900.00						
X	902004 3.4 - DHP	1.5		18	\$1,529.78						
X	902005 3.5a - 11.0 HSPF HP	1		15	\$1,529.78					-371	
	902006 3.6a - DHP (15% elec)	2		18	\$5,900.58						
	902007 4.1 - Deeply buried	0.5		50							
	902008 4.2 - HVAC inside	1		50	\$327.81					-385	
	9030 Hot Water										
	903001 5.1 - DWR	0.5		50	\$437.08					-260	
	903002 5.2 - 0.80 gas DHW	0.5		15	\$640.32						
	903003 5.3 - 0.91 gas DHW, GSHP	1		15	\$1,008.56					4.007	
	903004 5.4 - Tier III HPWH	2		15	\$955.02					-1407	
	903005 5.5 - CO2 HPWH	2.5		15	\$3,824.45					-1536	
-	9040 Other 904001 6.1 - Solar pV	4		25	\$5,040.00		1				
	904001 6.1 - Solar pV 904002 7.1 - ES Appl+ventless Dryer	0.5		15	\$5,040.00					-824	
	9050 2018 Compliant Building Cost	0.5		50	\$2,782.89		1			-024	
	2018 Compilant Building Cost Added Cost		1344	55	\$2,782.89		\$	1.008			
	9070 3ACH & Continuous Insulation		1344	50	\$1,405.00		5	1,405			
Z	Other Project Costs		1	30	\$1,405.00		Ť	1,-103			
	One Time - Upfront Costs		1	50							
	Re-Occurring Annual Cost (Track Inflation)		1	1							
	,	-									

<u>Small Heat Pump Home – Expenditure Report</u> Expenditure Report Page In Constant 2020 \$'s

	Cumulat	ive l	Expenditur	e S	Summary		Annual E	хр	enditure S	Sur	mmary
Year	Baseline		Alt. 1		Alt. 2		Baseline		Alt. 1		Alt. 2
2020	\$ 2,7	33 \$	5,642	\$	6,650	\$	2,783	\$	5,642	\$	6,6
2021	\$ 3,7	52 \$	6,381	\$	7,389	\$	969	\$	739	\$	7
2022	\$ 4,7	21 \$	7,120	\$	8,128	\$	969	\$	739	\$	7
2023	\$ 5,6	99 \$	7,866	\$	8,874	\$	979	\$	747	\$	7
2024	\$ 6,6	78 \$	8,613	\$	9,621	\$	979	\$	747	\$	7
2025	\$ 7,6	77 \$	9,375	\$	10,383	\$	999	\$	762	\$	7
2026	\$ 8,6		10,152	\$	11,160	\$	1,019	\$	777	\$	7
2027	\$ 9,7	14 \$	10,929	\$	11,937	\$	1,019	\$	777	\$	7
2028	\$ 10,7	33 \$	11,706	\$	12,714	\$	1,019	\$	777	\$	7
2029	\$ 11,7	_	12,483	\$	13,491	\$	1,019	\$	777	\$	7
2030	\$ 12,7	_	13,260	\$	14,268	\$	1,019	\$	777	\$	7
2031	\$ 13,7		14,045	\$	15,053	\$	1,029	\$	785	\$	7
2032	\$ 14,8	_	14,822	\$	15,830	\$	1,019	\$	777	\$	7
2033	\$ 15,8		15,599	\$	16,607	\$	1,019	\$	777	\$	7
2034	\$ 16,8		16,376	\$	17,384	\$	1,019	\$	777	\$	7
2035	\$ 17,8	-	18,541	\$	19,549	\$	1,019	\$	2,165	\$	2,1
2036	\$ 18,8		19,311	\$	20,319	\$	1,009	\$	769	\$	7
2037	\$ 19,8		20,080	\$	21,088	\$	1,009	\$	769	\$	7
2038	\$ 20,8	_	20,842	\$	21,850	\$	999	\$	762	\$	7
2039	\$ 21,8		21,604	\$	22,612	\$	999	\$	762	\$	7
2040	\$ 22,8		22,358	\$	23,366	\$	989	\$	754	\$	7
2041	\$ 23,8	- :	23,113	\$	24,121	\$	989	\$	754	\$	7
2042	\$ 24,8		23,859	\$	24,867	\$	979	\$	747	\$	7
2043	\$ 25,8		24,606	\$	25,614	\$	979	\$	747	\$	7
2044	\$ 26,7		25,345	\$	26,353	\$	969	\$	739	\$	7
2045	\$ 27,7		26,084	\$	27,092	\$	969	\$	739	\$	7
2046	\$ 28,7		26,823	\$	27,831	\$	969	\$	739	\$	7
2047	\$ 29,7	_	27,562	\$	28,570	\$	969	\$	739	\$	7
2048	\$ 30,6	_	28,293	\$	29,301	\$	959	\$	731	\$	7
2049	\$ 31,6		29,025	\$	30,033	\$	959	\$	731	\$	7
2050	\$ 32,5		31,136	\$	32,144	\$	949	\$	2,112	\$	2,1
2051	\$ 33,5		31,858	\$	32,866	\$	947	\$	722	\$	7
2052	\$ 34,4		32,579	\$	33,587	\$	945	\$	721	\$	7
2053	\$ 35,4		33,298	\$	34,306	\$	943	\$	719	\$	7
2054	\$ 36,3	_	34,016	\$	35,024	\$	941	\$	718	\$	7
2055 2056	\$ 37,2		34,732 35,447	\$	35,740 36,455	\$	939 937	\$	716 715	\$	7
	\$ 38,2	_	35,447			\$		\$		\$	7
2057	\$ 39,1 \$ 40,0	_	36,871		37,168 37,879	\$	935 933	_	713 712		7
2058		_	37,582			\$	933	_	712	\$	7
2059	\$ 41,0			_	38,590	\$			710	\$	7
2060	\$ 41,9 \$ 42,8		38,290	_	39,298 40,005	\$	929 927	\$	709	\$	7
2062		_	38,997 39,703	_		_		\$		\$	
		_		_	40,711	\$	925 923	_	705	\$	7
2063 2064		_	40,407	-	41,415	\$	923	\$	704 702	\$	7
2064	\$ 45,6 \$ 46,5		41,109 43,198	_	42,117	\$	921	_	2,089	\$	7
				_	44,206	_					2,0
2066	\$ 47,4	_	43,897	_	44,905	\$	917	\$	699	\$	6
2067	\$ 48,3	_	44,595	_	45,603	\$	915	_	698	\$	6
2068	\$ 49,3	-	45,291	-	46,299	\$	913	\$	696	\$	6
2069	\$ 50,2 \$ 51.1	_	45,986	_	46,994	\$	911	\$ ¢	695	\$ ¢	6
2070	\$ 51,1	24 \$	45,754	\$	46,671	\$	909	\$	(232)	>	(3

6,650

739

739 747

747

762

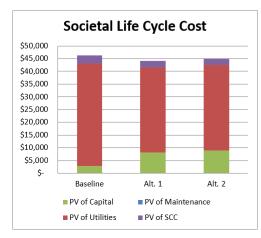
Small Zonal Electric Home – Executive Report

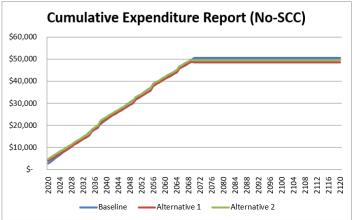
Key Analysis Var	iables	Building Ch	aracteristics
Study Period (years)	50	Gross (Sq.Ft)	1,344
Nominal Discount Rate	3.14%	Useable (Sq.Ft)	1,344
Maintenance Escalation	1.00%	Space Efficiency	100.0%
Zero Year (Current Year)	2020	Project Phase	0
Construction Years	0	Building Type	0

Life Cycle Cost Analysis		BEST	
Alternative	Baseline	Alt. 1	Alt. 2
Energy Use Intenstity (kBtu/sq.ft)	26.8	22.2	22.2
1st Construction Costs	\$ 2,783	\$ 3,890	\$ 4,898
PV of Capital Costs	\$ 2,783	\$ 8,073	\$ 9,016
PV of Maintenance Costs	\$ -	\$ -	\$ -
PV of Utility Costs	\$ 40,425	\$ 33,490	\$ 33,490
Total Life Cycle Cost (LCC)	\$ 43,208	\$ 41,563	\$ 42,506
Net Present Savings (NPS)	N/A	\$ 1,645	\$ 702

Societal LCC takes into consideration the social cost of carbon dioxide emissions caused by operational energy consumption

(GHG) Social Life Cycle Cost	BEST								
GHG Impact from Utility Consumption		Baseline		Alt. 1		Alt. 2			
Tons of CO2e over Study Period		39		32		32			
% CO2e Reduction vs. Baseline		N/A		17%		21%			
Present Social Cost of Carbon (SCC)	\$	2,970	\$	2,461	\$	2,461			
Total LCC with SCC	\$	46,178	\$	44,023	\$	44,967			
NPS with SCC		N/A	\$	2,155	\$	1,212			





<u>Small Zonal Electric Home – Baseline Input</u>

Primary Filter (Requires Level 1)					and Click OK to Re-filter						
	f Financial Management ı, Washington - Version: 2020-A		Show A	ll Entered	l Units (Requires Re-Filter)			l		
	le Cost Analysis Tool										
Basel	ine Input Page			Total B	uilding Annual Utility An	alysis	\$	950	Water (CCF)	Electricity (KWH)	Natural Gas (Therms)
					Annual Utility	Bill [\$]				\$ 950	\$
					nual Utility Consumption		/			10,554	
					Sum of Annual Utility Cor				-	-	
					Total Annual Utility C nnual Utility Bill ÷ Total U				Ś -	10,554 \$ 0.09	Ś
		+ ,	—		illiual Otility bill + Total O		Т		3 -	\$ 0.09	
Bu	format II Elemental Classification for uildings (Building Component List)	REF	# of Units	Useful Life (Yrs.)	Installed Cost (\$/Unit)	1st Year Maintenance Cost (\$/Unit)	Instal	omponent led Cost S's)	Annual Water (CCF/Unit)	Annual Electricity (KWH/Unit)	Annual Natural Gas (Therm/Unit)
v	Primary Entries Below: # of Units must	he > 0 t	o he counter	l· Hsoful I	ife must be >= 2		\$	2,783	Entries Belo	ow for Component :	Specific Litility A
A Subst	ructure	0000		, oscial i	ine made be y = Z		ľ	2,103	Entries belo	n for component.	procinc ounty A
B Shell											
C Interi											
D Servi											
	ment & Furnishings										
	al Construction & Demolition										
G Build	ing Sitework										
X9010 Bu	uilding Envelope										
X901001	1.1 - U24 Glaze	0.5		50	\$991.30					-173	
X901002	1.2 - U20 Glaze	1		50	\$1,453.90					-291	
X901003	1.3 - 5% UA reduc	0.5		50	\$955.15					-94	
X901004	1.4 - 15% UA reduc	1		50	\$1,925.40					-406	
X901005	1.5 - 22.5% UA reduc	1.5		50	\$2,937.75					-581	
X901006	1.6 - 30% UA reduc	2.5		50	\$6,819.02					-821	
X901007	2.1 - 2 ACH, HRV	0.5		50	\$1,395.16					10	
x X901008	2.2 - 1.5 ACH, HRV	1		50	\$3,333.70					-344	
X901009	2.3 - 0.6 ACH, HRV	1.5		50	\$4,305.90					-487	
	VAC										
X902001	3.1a - Furnace	1		18	\$251.59		-				
X902002	3.2a - 9.5 HSPF HP 3.3a - GSHP	0.5		15 20	\$1,387.73						
X902003 X902004	3.4 - DHP	1.5		18	\$10,900.00 \$1,529.78					-689	
X902004	3.5a - 11.0 HSPF HP	1.3		15	\$1,529.78					-089	
× X902003	3.6a - DHP (15% elec)	2		18	\$5,900.58					-1,154	
X902007	4.1 - Deeply buried	0.5		50	\$0.00					1,15	
X902008	4.2 - HVAC inside	1		50	\$327.81						
	ot Water				*						
X903001	5.1 - DWR	0.5		50	\$437.08					-247	
X903002	5.2 - 0.80 gas DHW	0.5		15	\$640.32						
X903003	5.3 - 0.91 gas DHW, GSHP	1		15	\$1,008.56						
X903004	5.4 - Tier III HPWH	2		15	\$955.02					-1,395	
X903005	5.5 - CO2 HPWH	2.5		15	\$3,824.45					-1,512	
	ther										
X904001	6.1 - Solar pV	1		25	\$5,040.00						
X904002	7.1 - ES Appl+ventless Dryer	0.5		15	\$504.83					-784	
	018 Compliant Building Cost		1	50	\$2,782.89		\$	2,783			
	dded Cost			55	\$0.75						
	ACH & Continuous Insulation			50	\$1,405.00						
	r Project Costs										
Z10 One 1	Fime - Upfront Costs ccurring Annual Cost (Track Inflation)		1	50 1							

Small Zonal Electric Home - ALT 1

Primary Filter (Requires Level 1)				and Click OK to Re-filter		_		1		
Office of Financial Management		O Manua	l Special S	election Only (Requires R	efilter)					
Olympia, Washington - Version: 2020-A		Show E	Baseline Fi	elds and Entered Units (R	equires Refilter)					
Life Cycle Cost Analysis Tool		O Show [Difference	s Between Alternative and	d Baseline (Req. R	efilter)				
Alternative 1 Input Page			Total Bu	ilding Annual Utility An	alysis	\$	787	Water (CCF)	Electricity (KWH)	Natural Gas (Therms)
				Annual Utility E	Bill [\$]	1		()	\$ 787	(**************************************
			An	nual Utility Consumption		v			10,827	
			9	Sum of Annual Utility Con	sumption Below			112	(2,083)	
				Total Annual Utility Co				1/2	8,743	
N			Aı	nnual Utility Bill ÷ Total Ut	ility Consumption			\$ -	\$ 0.09	\$
Note: No Units Assigned to a Component with Entries	-	_			100	Ť.				
Uniformat II Elemental Classification for			Useful	Installed Cost	1st Year		omponent	Annual	Annual Electricity	Annual
Buildings (Building Component List)	REF	# of Units	Life	(\$/Unit)	Maintenance		alled Cost	Water (CCF/Unit)		Natural Ga
Buildings (Building Component List)			(Yrs.)	(5) offic	Cost (\$/Unit)	. 9	(\$'s)	water (eer / orint)	(Revery office)	(Therm/Uni
Primary Entries Below: # of Un	its mus	t be > 0 to b	e counted	; Useful Life must be >= 2		25		Entries Belo	ow for Component	Specific Utility
Match Baseline: Filter to Select All & Drag Copy O14:S14 & U14:AG14						\$	3,890			
A Substructure										
B Shell										
C Interiors										
D Services										
E Equipment & Furnishings										
F Special Construction & Demolition										
G Building Sitework										
X9010 Building Envelope	0.5			6004					472	
X901001 1.1 - U24 Glaze X901002 1.2 - U20 Glaze	0.5		50 50	\$991 \$1.454					-173 -291	
X901002 1.2 - 020 Glaze X901003 1.3 - 5% UA reduc	0.5		50	\$1,454					-291	
X901003 1.3 - 3% 0A reduc X901004 1.4 - 15% UA reduc	0.3		50	\$1,925	7				-406	
X901004 1.4 - 13% 0A reduc X901005 1.5 - 22.5% UA reduc	2		50	\$2,938					-581	
X901006 1.6 - 30% UA reduc	3		50	\$6,819					-821	
X901007 2.1 - 2 ACH, HRV	1		50	\$1,395					10	
X901008 2.2 - 1.5 ACH, HRV	1.5		50	\$3,334					-344	
X901009 2.3 - 0.6 ACH, HRV	2		50	\$4,306					-487	
X9020 HVAC										
X902001 3.1a - Furnace	1		18	\$252						
X902002 3.2a - 9.5 HSPF HP	0.5		15	\$1,388						
X902003 3.3a - GSHP	1.5		20	\$10,900						
X902004 3.4 - DHP	1.5	1	18	\$1,530		\$	1,530		-689	
X902005 3.5a - 11.0 HSPF HP	1		15	\$1,530						
X902006 3.6a - DHP (15% elec)	2		18	\$5,901					-1154	
X902007 4.1 - Deeply buried	1		50							
X902008 4.2 - HVAC inside	1.5		50	\$328						
X9030 Hot Water	0.5		50	6437					247	
X903001 5.1 - DWR	0.5		50 15	\$437 \$640					-247	
X903002 5.2 - 0.80 gas DHW X903003 5.3 - 0.91 gas DHW, GSHP	0.5		15	\$1,009						
X903004 5.4 - Tier III HPWH	2	1	15	\$1,009		\$	955		-1395	
X903004 5.5 - CO2 HPWH	2.5		15	\$3,824		7	233		-1512	
X9040 Other	2.13			\$3,024					1012	
X904001 6.1 - Solar pV	1		25	\$5,040						
X904002 7.1 - ES Appl+ventless Dryer	0.5		15	\$505					-784	
X9050 2018 Compliant Building Cost			50	\$2,783						
X9060 Added Cost			55	\$1						
X9070 3ACH & Continuous Insulation		1	50	\$1,405		\$	1,405			
Z Other Project Costs										
Z10 One Time - Upfront Costs		1	50							

Small Zonal Electric Home – ALT 2

					lab law profile									
<- P	rimary Filter (Requires Level 1)				and Click OK to Re-filter	ofile on								
	Office of Financial Management		-		Selection Only (Requires R									
	Olympia, Washington - Version: 2020-A		Show B	aseline F	ields and Entered Units (R	equires Refilter)								
	Life Cycle Cost Analysis Tool		O Show D	ifference	es Between Alternative and									
	Alternative 2 Input Page			Total B	uilding Annual Utility Ana	alysis	\$	787	Water (CCF)	Water (CCF) Electricity (KWH) Natural Gas (Therms)				
					Annual Utility E	Bill [\$]			()	\$ 787	()			
				Ar	nnual Utility Consumption		v	,	-	\$ 10,827				
					Sum of Annual Utility Con					(2,083)	-			
					Total Annual Utility Co					8,743	-			
				P	nnual Utility Bill ÷ Total Ut	ility Consumption			\$ -	\$ 0.09	\$ -			
_	Note: No Units Assigned to a Component with Entries						T							
S H O	Uniformat II Elemental Classification for Buildings (Building Component List)	REF	# of Units	Useful Life	Installed Cost (\$/Unit)	1st Year Maintenance	Instal	omponent led Cost	Annual Water (CCF/Unit)	Annual Electricity (KWH/Unit)	Annual Natural Gas			
w				(Yrs.)	100.000	Cost (\$/Unit)	(:	\$'s)	80 08 80	D 15 At	(Therm/Unit)			
	Primary Entries Below: # of Unit	s mus	t be > 0 to be	counte	d; Useful Life must be >= 2				Entries Belo	w for Component	Specific Utility Analy			
	Match Baseline: Filter to Select All & Drag Copy O14:S14 & U14:AG14						\$	4,898						
	A Substructure													
	B Shell													
	C Interiors	-					-							
	D Services					:								
	E Equipment & Furnishings F Special Construction & Demolition													
	G Building Sitework	-					-							
	X9010 Building Envelope													
	X901001 1.1 - U24 Glaze	0.5		50	\$991					-173				
	X901001 1.1 - U24 Glaze X901002 1.2 - U20 Glaze	1		50	\$1,454					-173				
	X901002 1.2 - 020 Glaze X901003 1.3 - 5% UA reduc	0.5		50	\$1,454			-		-94				
	X901003 1.3 - 5% UA reduc X901004 1.4 - 15% UA reduc	1		50	\$1,925					-406				
	X901005 1.5 - 22.5% UA reduc	1.5		50	\$2,938					-581				
	X901006 1.6 - 30% UA reduc	2.5		50	\$6,819					-821				
	X901007 2.1 - 2 ACH, HRV	0.5		50	\$1,395					10				
	X901008 2.2 - 1.5 ACH, HRV	1		50	\$3,334					-344				
	X901009 2.3 - 0.6 ACH, HRV	1.5		50	\$4,306					-487				
	X9020 HVAC				, ,,									
	X902001 3.1a - Furnace	1		18	\$252									
	X902002 3.2a - 9.5 HSPF HP	0.5		15	\$1,388									
	X902003 3.3a - GSHP	1.5		20	\$10,900			İ						
	X902004 3.4 - DHP	1.5	1	18	\$1,530		\$	1,530		-689				
	X902005 3.5a - 11.0 HSPF HP	1		15	\$1,530									
	X902006 3.6a - DHP (15% elec)	2		18	\$5,901					-1154				
	X902007 4.1 - Deeply buried	0.5		50										
	X902008 4.2 - HVAC inside	1		50	\$328									
	X9030 Hot Water													
	X903001 5.1 - DWR	0.5		50	\$437					-247				
	X903002 5.2 - 0.80 gas DHW	0.5		15	\$640									
	X903003 5.3 - 0.91 gas DHW, GSHP	1		15	\$1,009					45				
	X903004 5.4 - Tier III HPWH	2	1	15	\$955		\$	955		-1395				
	X903005 5.5 - CO2 HPWH	2.5		15	\$3,824		-			-1512				
	X9040 Other			25	AF 040									
	X904001 6.1 - Solar pV X904002 7.1 - ES Appl+ventless Dryer	0.5		25 15	\$5,040 \$505					704				
		0.5		50						-784				
	X9050 2018 Compliant Building Cost X9060 Added Cost		1344	55	\$2,783 \$1		S	1,008						
	X9070 3ACH & Continuous Insulation		1544	50	\$1,405		\$	1,405						
	Z Other Project Costs		1	30	\$1,405		J	1,403						
	Z10 One Time - Upfront Costs		1	50										
	Z30 Re-Occurring Annual Cost (Track Inflation)		1	1										
	Last Internation		_	_										

Small Zonal Electric Home-Expenditure Report Expenditure Report Page In Constant 2020 \$'s

	Cumulativ	e Expenditur	e Sur	nmary	Annual E	Хŗ	oenditure S	Sur	nmary
Year	Baseline	Alt. 1	1	Alt. 2	Baseline		Alt. 1		Alt. 2
2020	\$ 2,783	\$ 3,890	\$	4,898	\$ 2,783	\$	3,890	\$	4,898
2021	\$ 3,743	\$ 4,685	\$	5,693	\$ 960	\$	795	\$	795
2022	\$ 4,702	\$ 5,480	\$	6,488	\$ 960	\$	795	\$	795
2023	\$ 5,672	\$ 6,283	\$	7,291	\$ 970	\$	803	\$	803
2024	\$ 6,642	\$ 7,087	\$	8,095	\$ 970	\$	803	\$	803
2025	\$ 7,631	\$ 7,906	\$	8,914	\$ 989	\$	820	\$	820
2026	\$ 8,640	\$ 8,742	\$	9,750	\$ 1,009	\$	836	\$	836
2027	\$ 9,650	\$ 9,579	\$	10,587	\$ 1,009	\$	836	\$	836
2028	\$ 10,659	\$ 10,415	\$	11,423	\$ 1,009	\$	836	\$	836
2029	\$ 11,668	\$ 11,251	\$	12,259	\$ 1,009	\$	836	\$	836
2030	\$ 12,677	\$ 12,087	\$	13,095	\$ 1,009	\$	836	\$	836
2031	\$ 13,696	\$ 12,931	\$	13,939	\$ 1,019	\$	844	\$	844
2032	\$ 14,706	\$ 13,767	\$	14,775	\$ 1,009	\$	836	\$	836
2033	\$ 15,715	\$ 14,603	\$	15,611	\$ 1,009	\$	836	\$	836
2034	\$ 16,724	\$ 15,439	\$	16,447	\$ 1,009	\$	836	\$	836
2035	\$ 17,733	\$ 17,230	\$	18,238	\$ 1,009	\$	1,791	\$	1,791
2036	\$ 18,733	\$ 18,058	\$	19,066	\$ 999	\$	828	\$	828
2037	\$ 19,732	\$ 18,886	\$	19,894	\$ 999	\$	828	\$	828
2038	\$ 20,721	\$ 21,236	\$	22,244	\$ 989	\$	2,349	\$	2,349
2039	\$ 21,711	\$ 22,055	\$	23,063	\$ 989	\$	820	\$	820
2040	\$ 22,690	\$ 22,867	\$	23,875	\$ 980	\$	812	\$	812
2041	\$ 23,670	\$ 23,678	\$	24,686	\$ 980	\$	812	\$	812
2042	\$ 24,640	\$ 24,482	\$	25,490	\$ 970	\$	803	\$	803
2043	\$ 25,609	\$ 25,285	\$	26,293	\$ 970	\$	803	\$	803
2044	\$ 26,569	\$ 26,080	\$	27,088	\$ 960	\$	795	\$	795
2045	\$ 27,529	\$ 26,875	\$	27,883	\$ 960	\$	795	\$	795
2046	\$ 28,489	\$ 27,670	\$	28,678	\$ 960	\$	795	\$	795
2047	\$ 29,448	\$ 28,465	\$	29,473	\$ 960	\$	795	\$	795
2048	\$ 30,398	\$ 29,252	\$	30,260	\$ 950	\$	787	\$	787
2049	\$ 31,348	\$ 30,039	\$	31,047	\$ 950	\$	787	\$	787
2050	\$ 32,288	\$ 31,773	\$	32,781	\$ 940	\$	1,734	\$	1,734
2051	\$ 33,226	\$ 32,550	\$	33,558	\$ 938	\$	777	\$	777
2052	\$ 34,162	\$ 33,326	\$	34,334	\$ 936	\$	775	\$	775
2053	\$ 35,096	\$ 34,099	\$	35,107	\$ 934	\$	774	\$	774
2054	\$ 36,028	\$ 34,872	\$	35,880	\$ 932	\$	772	\$	772
2055	\$ 36,958	\$ 35,642	\$	36,650	\$ 930	\$	771	\$	771
2056	\$ 37,886		\$	38,949	\$ 928	\$	2,299	\$	2,299
2057	\$ 38,812	\$ 38,708	\$	39,716	\$ 926	\$	767	\$	767
2058	\$ 39,737	\$ 39,474	\$	40,482	\$ 924	\$	766	\$	766
2059	\$ 40,659		\$	41,245	\$ 922	\$	764	\$	764
2060	\$ 41,579	\$ 41,000	\$	42,008	\$ 920	\$	762	\$	762
2061	\$ 42,497	\$ 41,760	\$	42,768	\$ 918	\$	761	\$	761
2062	\$ 43,413		\$	43,528	\$ 916	\$	759	\$	759
2063	\$ 44,328		\$	44,285	\$ 914	\$	757	\$	757
2064	\$ 45,240	\$ 44,033	\$	45,041	\$ 912	\$	756	\$	756
2065	\$ 46,150		\$	46,750	\$ 910	\$	1,709	\$	1,709
2066	\$ 47,059		\$	47,502	\$ 908	\$	752	\$	752
2067	\$ 47,965	\$ 47,245	\$	48,253	\$ 906	\$	751	\$	751
2068	\$ 48,869		\$	49,002	\$ 904	\$	749	\$	749
2069	\$ 49,772	\$ 48,742	\$	49,750	\$ 902	\$	748	\$	748
2070	\$ 50,672	\$ 48,511	\$	49,428	\$ 900	\$	(231)	\$	(322)

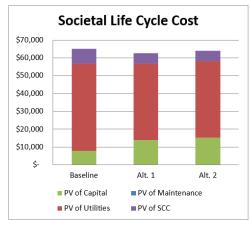
Medium Gas Home – Executive Report

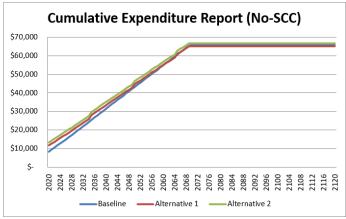
Key Analysis Va	riables	Building Ch	aracteristics
Study Period (years)	50	Gross (Sq.Ft)	2,200
Nominal Discount Rate	3.14%	Useable (Sq.Ft)	2,200
Maintenance Escalation	1.00%	Space Efficiency	100.0%
Zero Year (Current Year)	2020	Project Phase	0
Construction Years	0	Building Type	0

Life Cycle Cost Analysis		BEST	
Alternative	Baseline	Alt. 1	Alt. 2
Energy Use Intenstity (kBtu/sq.ft)	25.3	20.5	20.5
1st Construction Costs	\$ 8,340	\$ 11,666	\$ 13,316
PV of Capital Costs	\$ 7,805	\$ 13,763	\$ 15,308
PV of Maintenance Costs	\$ -	\$ -	\$ -
PV of Utility Costs	\$ 48,921	\$ 42,905	\$ 42,905
Total Life Cycle Cost (LCC)	\$ 56,726	\$ 56,668	\$ 58,213
Net Present Savings (NPS)	N/A	\$ 58	\$ (1,486)

Societal LCC takes into consideration the social cost of carbon dioxide emissions caused by operational energy consumption

(GHG) Social Life Cycle Cost		BEST	
GHG Impact from Utility Consumption	Baseline	Alt. 1	Alt. 2
Tons of CO2e over Study Period	100	72	72
% CO2e Reduction vs. Baseline	N/A	28%	39%
Present Social Cost of Carbon (SCC)	\$ 8,249	\$ 5,859	\$ 5,859
Total LCC with SCC	\$ 64,976	\$ 62,527	\$ 64,072
NPS with SCC	N/A	\$ 2,448	\$ 904





Medium Gas Home - Baseline Input

<- Primary Filter (Requires Level 1)		Onen Prim	anı Eiltar	and Click OK to Re-filter		-			
Office of Financial Management	,			d Units (Requires Re-Filt	er)				
Olympia, Washington - Version: 2020-A		511047	, iii Eiitere	a omes (neganes ne me	c.,				
Life Cycle Cost Analysis Tool						•			
Baseline Input Page			Total B	uilding Annual Utility An	alysis	\$ 1,069	Water (CCF)	Electricity (KWH)	Natural Gas (Therms)
				Annual Utility	Bill [\$]		(00.7	\$ 806	\$ 263
			Ann	ual Utility Consumption		w		8,958	250
			S	um of Annual Utility Cor					-
				Total Annual Utility (- 8,958	250
	—		An	nual Utility Bill ÷ Total U	tility Consumption		\$	- \$ 0.09	\$ 1.05
Uniformat II Elemental Classification for			Useful	Installed Cost	1st Year	Total	Annual	Annual	Annual
H D. T. P. C. T. P. P. P. C. T. P. P. C. T. P. P. C. T. P. P. C. T. P.	REF	# of Units	Life	(\$/Unit)	Maintenance	Component Installed Cost	Water	Electricity	Natural Gas
Buildings (Building Component List)			(Yrs.)	(5/01111)	Cost (\$/Unit)	(\$'s)	(CCF/Unit)	(KWH/Unit)	(Therm/Unit)
Primary Entries Below: # of Units must be	e > 0 t	o be counte	d: Useful	Life must be >= 2		\$ 8,340	Entries Belov	w for Component S	pecific Utility Analy
A Substructure									
B Shell									
C Interiors									
D Services									
E Equipment & Furnishings									
F Special Construction & Demolition									
G Building Sitework									
x X9010 Building Envelope x X901001 1.1 - U24 Glaze	0.5		50	\$1,789.84				202	-5
x X901001 1.1 - U24 Glaze x X901002 1.2 - U20 Glaze	1		50	\$2,625.10				-292 -369	-18
x X901002 1.2 - 020 Glaze x X901003 1.3 - 5% UA reduc	0.5		50	\$1,270.23				70	2
× X901004 1.4 - 15% UA reduc	1		50	\$3,255.06				-288	-28
x X901005 1.5 - 22.5% UA reduc	2		50	\$4,849.92				-577	-41
x X901006 1.6 - 30% UA reduc	3		50	\$12,094.52				-887	-69
x X901007 2.1 - 2 ACH, HRV	1		50	\$2,283.74				271	-19
x X901008 2.2 - 1.5 ACH, HRV	1.5		50	\$5,456.94				-87	-67
x X901009 2.3 - 0.6 ACH, HRV	2		50	\$7,048.35				-530	-78
x X9020 HVAC									
x X902001 3.1a - Furnace x X902002 3.2a - 9.5 HSPF HP	0.5		18 15	\$251.59 \$1,387.73				-55	-51
	1.5		20	\$1,387.73					
x X902003 3.3a - GSHP x X902004 3.4 - DHP	1.5		18	\$10,900.00					
x X902005 3.5a - 11.0 HSPF HP	1		15	\$1,529.78					
x X902006 3.6a - DHP (15% elec)	2		18	\$5,900.58					
x X902007 4.1 - Deeply buried	1		50	\$0.00					
x X902008 4.2 - HVAC inside	1.5		50	\$327.81				-781	-38
x X9030 Hot Water									
x X903001 5.1 - DWR	0.5		50	\$437.08				55	-33
x X903002 5.2 - 0.80 gas DHW	0.5		15	\$640.32				-3	-34
x X903003 5.3 - 0.91 gas DHW, GSHP x X903004 5.4 - Tier III HPWH	2		15 15	\$1,008.56 \$955.02				-12	-48
x X903004 5.4 - Tier III HPWH x X903005 5.5 - CO2 HPWH	2.5		15	\$955.02				-1,761 -1,916	
x X9040 Other	2.3		13	\$3,024.43				-1,510	
x X904001 6.1 - Solar pV	1		25	\$5,040.00					
x X904002 7.1 - ES Appl+ventless Dryer	0.5		15	\$504.83				-625	
x X9050 2018 Compliant Building Cost		1	55	\$8,340.00		\$ 8,340			
x X9060 Added Cost			55	\$0.75					
x X906001 3ACH, continuous ins			55	\$2,561.00					
Z Other Project Costs									
Z10 One Time - Upfront Costs		1	50						
Z30 Re-Occurring Annual Cost (Track Inflation)		1	1						

Medium Gas Home - ALT 1

Primary Filter	(Requires Level 1)		Open Prim	ary Filter	and Click OK to Re-filter						
	f Financial Management				Selection Only (Requires	Refilter)			1		
	, Washington - Version: 2020-A		_		Fields and Entered Units						
							•				
•	le Cost Analysis Tool		O Show	Differenc	es Between Alternative a	nd Baseline (Req	. Refilter)			1	
Altern	native 1 Input Page			Total B	uilding Annual Utility An	alysis	\$	961	Water (CCF)	Electricity (KWH)	Natural Gas (Therms)
					Annual Utility I	3ill [\$]				\$ 809	
					nual Utility Consumption		w			8,903	48
				5	ium of Annual Utility Cor					- 81	(336
					Total Annual Utility C					8,984	14
Note: No I	Jnits Assigned to a Component with Entries			An	nual Utility Bill ÷ Total U	tility Consumptio	n		\$	- \$ 0.09	\$ 1.0
Note. No C	onits Assigned to a Component with Entries						Tota				
Unif	format II Elemental Classification for			Useful	Installed Cost	1st Year	Compor		Annual	Annual	Annual
		REF	# of Units	Life	(\$/Unit)	Maintenance	Installed		Water	Electricity	Natural Gas
В	uildings (Building Component List)			(Yrs.)	(3/01111)	Cost (\$/Unit)	(\$'s)	COST	(CCF/Unit)	(KWH/Unit)	(Therm/Unit)
	Primary Entries Below: # of Un	its must	be > 0 to b	e counte	d; Useful Life must be >=	2	(53)		Entries Belov	v for Component S	oecific Utility An
Match Basel	ine: Filter to Select All & Drag Copy O14:S14 & U14:AG14						\$ 1	1,666			
	tructure										
B Shell											
C Interi	iors										
D Service	ces										
E Equip	oment & Furnishings										
F Speci	al Construction & Demolition										
G Build	ing Sitework										
X9010 Bu	uilding Envelope										
X901001	1.1 - U24 Glaze	0.5		50	\$1,789.84					-292	-5
X901002	1.2 - U20 Glaze	1		50	\$2,625.10					-369	-18
X901003	1.3 - 5% UA reduc	0.5		50	\$1,270.23					70	2
X901004	1.4 - 15% UA reduc	1		50	\$3,255.06					-288	-28
X901005	1.5 - 22.5% UA reduc	2	1	50	\$4,849.92		\$	4,850		-577	-41
X901006	1.6 - 30% UA reduc	3		50	\$12,094.52					-887	-69
X901007	2.1 - 2 ACH, HRV	1	1	50	\$2,283.74		\$	2,284		271	-19
X901008	2.2 - 1.5 ACH, HRV	1.5		50	\$5,456.94					-87	-67
X901009	2.3 - 0.6 ACH, HRV	2		50	\$7,048.35					-530	-78
	VAC										
X902001	3.1a - Furnace	1	1	18	\$251.59		\$	252		-55	-51
X902002	3.2a - 9.5 HSPF HP	0.5		15	\$1,387.73						
X902003	3.3a - GSHP	1.5		20	\$10,900.00						
X902004	3.4 - DHP	1.5		18	\$1,529.78						
X902005	3.5a - 11.0 HSPF HP	1		15	\$1,529.78						
X902006	3.6a - DHP (15% elec)	2		18	\$5,900.58						
X902007	4.1 - Deeply buried	1		50							
X902008	4.2 - HVAC inside	1.5	1	50	\$327.81		\$	328		-781	-38
	ot Water	0.7			A			40=			
X903001	5.1 - DWR	0.5	1		\$437.08		\$	437		55	-33
X903002	5.2 - 0.80 gas DHW	0.5		15	\$640.32					-3	-34
X903003	5.3 - 0.91 gas DHW, GSHP	1		15	\$1,008.56		c	055		-12	-48
X903004	5.4 - Tier III HPWH	2	1		\$955.02		\$	955		1167	-153
X903005	5.5 - CO2 HPWH	2.5		15	\$3,824.45					1099	-156
X9040 Ot X904001	ther	1		25	\$5,040.00						
X904001 X904002	6.1 - Solar pV	0.5		15	\$5,040.00					-625	
	7.1 - ES Appl+ventless Dryer	0.5		55	\$8,340.00					-025	
	018 Compliant Building Cost dded Cost		1		\$8,340.00		s	2,561			
	r Project Costs		1	55	\$2,561.00		3	2,301			
	r Project Costs Time - Upfront Costs		1								
	rime - opiront Costs		1	50							

Medium Gas Home – ALT 2

<- Primary Filter (Requires Level 1)		Open Prima	ary Filter	and Click OK to Re-filter						
Office of Financial Management		Manual Special Selection Only (Requires Refilter)								
Olympia, Washington - Version: 2020-A		Show Baseline Fields and Entered Units (Requires Refilter)								
Life Cycle Cost Analysis Tool		O Show I	Difference	es Between Alternative a						
Alternative 2 Input Page		○ Show Differences Between Alternative and Baseline (Req. Refilter) Total Building Annual Utility Analysis \$ 961							Electricity (KWH)	Natural Gas (Therms)
. •				Annual Utility	Bill [\$]			(CCF)	\$ 809	
			An	nual Utility Consumption		w		-	8,903	481
				Sum of Annual Utility Cor				-	81	(336)
				Total Annual Utility C				-	8,984	145
			Ar	nual Utility Bill ÷ Total U	tility Consumptio	n		\$ -	\$ 0.09	\$ 1.05
Note: No Units Assigned to a Component with Entries						т	otal			
Uniformat II Elemental Classification for			Useful	Installed Cost	1st Year		ponent	Annual	Annual	Annual
Buildings (Building Component List)	REF	# of Units	Life	(\$/Unit)	Maintenance		led Cost	Water	Electricity	Natural Gas
w			(Yrs.)	, ,	Cost (\$/Unit)		\$'s)	(CCF/Unit)	(KWH/Unit)	(Therm/Unit)
Primary Entries Below: # of Unit	s must	be > 0 to be	e counte	d; Useful Life must be >=	2			Entries Below	for Component S	pecific Utility Analy
Match Baseline: Filter to Select All & Drag Copy O14:S14 & U14:AG14						\$	13,316			
. A Substructure										
B Shell C Interiors										
C Interiors D Services										
E Equipment & Furnishings										
F Special Construction & Demolition										
G Building Sitework										
X9010 Building Envelope										
X901001 1.1 - U24 Glaze	0.5		50	\$1,789.84					-292	-5
X901002 1.2 - U20 Glaze	1		50	\$2,625.10					-369	-18
X901003 1.3 - 5% UA reduc	0.5		50						70	2
X901004 1.4 - 15% UA reduc	1		50	\$3,255.06					-288	-28
X901005 1.5 - 22.5% UA reduc	2	1	50	\$4,849.92		\$	4,850		-577	-41
X901006 1.6 - 30% UA reduc	3		50	\$12,094.52					-887	-69
X901007 2.1 - 2 ACH, HRV	1	1	50			\$	2,284		271	-19
X901008 2.2 - 1.5 ACH, HRV	1.5		50						-87	-67
X901009 2.3 - 0.6 ACH, HRV	2		50	\$7,048.35					-530	-78
X9020 HVAC										
X902001 3.1a - Furnace	1	1	18			\$	252		-55	-51
X902002 3.2a - 9.5 HSPF HP X902003 3.3a - GSHP	0.5 1.5		15 20							
X902003 3.3a - GSHP X902004 3.4 - DHP	1.5		18	\$10,900.00 \$1,529.78						
X902005 3.5a - 11.0 HSPF HP	1.3		15							
X902006 3.6a - DHP (15% elec)	2		18	\$5,900.58						
X902007 4.1 - Deeply buried	1		50	. ,						
X902008 4.2 - HVAC inside	1.5	1	50	\$327.81		\$	328		-781	-38
X9030 Hot Water										
X903001 5.1 - DWR	0.5	1	50	\$437.08		\$	437		55	-33
X903002 5.2 - 0.80 gas DHW	0.5		15	\$640.32					-3	-34
X903003 5.3 - 0.91 gas DHW, GSHP	1		15	\$1,008.56					-12	-48
X903004 5.4 - Tier III HPWH	2	1	15	\$955.02		\$	955		1167	-153
X903005 5.5 - CO2 HPWH	2.5		15	\$3,824.45					1099	-156
X9040 Other X904001 6.1 - Solar pV	1		25	\$5,040.00						
X904001 6.1 - Solar pV X904002 7.1 - ES Appl+ventless Dryer	0.5		15	\$5,040.00 \$504.83					-625.255731	
X9050 2018 Compliant Building Cost	0.5		55	\$8,340.00					-023.233731	
X9060 Added Cost		2200	55	\$0.75		\$	1,650			
X906001 3ACH, continuous ins		1	55	\$2,561.00		Ś	2,561			
Z Other Project Costs				1 _,502.00						
Z10 One Time - Upfront Costs		1	50							
Z30 Re-Occurring Annual Cost (Track Inflation)		1	1							

Medium Gas Home – Expenditure Report Expenditure Report Page In Constant 2020 \$'s

	Cumulative	e Expenditur	e S	ummary	Annual E	хр	enditure S	Su	mmary
Year	Baseline	Alt. 1		Alt. 2	Baseline		Alt. 1		Alt. 2
2020	\$ 8,340	\$ 11,666	\$	13,316	\$ 8,340	\$	11,666	\$	13,316
2021	\$ 9,417	\$ 12,636	\$	14,286	\$ 1,077	\$	970	\$	970
2022	\$ 10,494	\$ 13,605	\$	15,255	\$ 1,077	\$	970	\$	970
2023	\$ 11,582	\$ 14,585	\$	16,235	\$ 1,088	\$	980	\$	980
2024	\$ 12,676	\$ 15,567	\$	17,217	\$ 1,093	\$	983	\$	983
2025	\$ 13,794	\$ 16,571	\$	18,221	\$ 1,118	\$	1,004	\$	1,004
2026	\$ 14,933	\$ 17,595	\$	19,245	\$ 1,140	\$	1,024	\$	1,024
2027	\$ 16,079	\$ 18,622	\$	20,272	\$ 1,145	\$	1,027	\$	1,027
2028	\$ 17,226	\$ 19,650	\$	21,300	\$ 1,148	\$	1,028	\$	1,028
2029	\$ 18,377	\$ 20,680	\$	22,330	\$ 1,150	\$	1,030	\$	1,030
2030	\$ 19,555	\$ 21,727	\$	23,377	\$ 1,179	\$	1,046	\$	1,046
2031	\$ 20,751	\$ 22,786	\$	24,436	\$ 1,195	\$	1,059	\$	1,059
2032	\$ 21,937	\$ 23,837	\$	25,487	\$ 1,187	\$	1,051	\$	1,051
2033	\$ 23,129	\$ 24,891	\$	26,541	\$ 1,192	\$	1,054	\$	1,054
2034	\$ 24,326	\$ 25,948	\$	27,598	\$ 1,197	\$	1,057	\$	1,057
2035	\$ 25,523	\$ 27,960	\$	29,610	\$ 1,197	\$	2,012	\$	2,012
2036	\$ 26,715	\$ 29,010	\$	30,660	\$ 1,191	\$	1,050	\$	1,050
2037	\$ 27,906	\$ 30,060	\$	31,710	\$ 1,191	\$	1,050	\$	1,050
2038	\$ 29,091	\$ 31,355	\$	33,005	\$ 1,185	\$	1,295	\$	1,295
2039	\$ 30,279	\$ 32,400	\$	34,050	\$ 1,188	\$	1,045	\$	1,045
2040	\$ 31,459	\$ 33,436	\$	35,086	\$ 1,180	\$	1,036	\$	1,036
2041	\$ 32,641	\$ 34,474	\$	36,124	\$ 1,182	\$	1,038	\$	1,038
2042	\$ 33,815	\$ 35,503	\$	37,153	\$ 1,174	\$	1,029	\$	1,029
2043	\$ 34,992	\$ 36,534	\$	38,184	\$ 1,176	\$	1,031	\$	1,031
2044	\$ 36,160	\$ 37,557	\$	39,207	\$ 1,168	\$	1,022	\$	1,022
2045	\$ 37,330	\$ 38,581	\$	40,231	\$ 1,171	\$	1,024	\$	1,024
2046	\$ 38,504	\$ 39,606	\$	41,256	\$ 1,173	\$	1,026	\$	1,026
2047	\$ 39,680	\$ 40,633	\$	42,283	\$ 1,176	\$	1,027	\$	1,027
2048	\$ 40,847	\$ 41,652	\$	43,302	\$ 1,167	\$	1,019	\$	1,019
2049	\$ 42,017	\$ 42,672	\$	44,322	\$ 1,170	\$	1,020	\$	1,020
2050	\$ 43,181	\$ 44,640	\$	46,290	\$ 1,164	\$	1,968	\$	1,968
2051	\$ 44,346	\$ 45,653	\$	47,303	\$ 1,165	\$	1,013	\$	1,013
2052	\$ 45,511	\$ 46,665	\$	48,315	\$ 1,165	\$	1,012	\$	1,012
2053	\$ 46,677	\$ 47,677	\$	49,327	\$ 1,165	\$	1,012	\$	1,012
2054	\$ 47,843	\$ 48,688	\$	50,338	\$ 1,166	\$	1,011	\$	1,011
2055	\$ 49,009	\$ 49,699	\$	51,349	\$ 1,166	\$	1,011	\$	1,011
2056	\$ 50,176	\$ 50,961	\$	52,611	\$ 1,167	\$	1,262	\$	1,262
2057	\$ 51,343	\$ 51,971	\$	53,621	\$ 1,167	\$	1,010	\$	1,010
2058	\$ 52,510	\$ 52,980	\$	54,630	\$ 1,167		1,009	\$	1,009
2059	\$ 53,678	\$ 53,989	\$	55,639	\$ 1,168		1,009	\$	1,009
2060	\$ 54,846	\$ 54,998	\$	56,648	\$ 1,168		1,008	\$	1,008
2061	\$ 56,015	\$ 56,006	\$	57,656	\$ 1,169		1,008	\$	1,008
2062	\$ 57,184	\$ 57,013	\$	58,663	\$ 1,169	\$	1,007	\$	1,007
2063	\$ 58,354	\$ 58,020	\$	59,670	\$ 1,169	\$	1,007	\$	1,007
2064	\$ 59,523	\$ 59,027	\$	60,677	\$ 1,170	_	1,007	\$	1,007
2065	\$ 60,694	\$ 60,988	\$	62,638	\$ 1,170		1,961	\$	1,961
2066	\$ 61,864	\$ 61,993	\$	63,643	\$ 1,171		1,006	\$	1,006
2067	\$ 63,035	\$ 62,998	\$	64,648	\$ 1,171		1,005	\$	1,005
2068	\$ 64,207	\$ 64,003	\$	65,653	\$ 1,171	_	1,005	\$	1,005
2069	\$ 65,379	\$ 65,007	\$	66,657	\$ 1,172	\$	1,004	\$	1,004
2070	\$ 65,793	\$ 65,085	\$	66,585	\$ 414	\$	78	\$	(72)

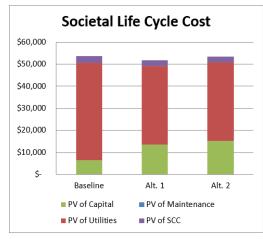
Medium Heat Pump Home – Executive Report

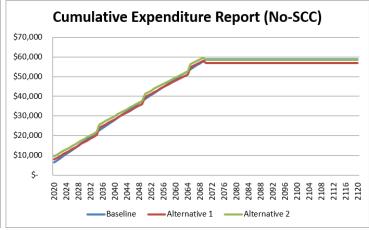
Key Analysis V	Building Characteristics				
Study Period (years)	50	Gross (Sq.Ft)	2,200		
Nominal Discount Rate	3.14%	Useable (Sq.Ft)	2,200		
Maintenance Escalation	1.00%	Space Efficiency	100.0%		
Zero Year (Current Year)	2020	Project Phase	0		
Construction Years	0	Building Type	0		

Life Cycle Cost Analysis	BEST								
Alternative	Baseline		Alt. 1		Alt. 2				
Energy Use Intenstity (kBtu/sq.ft)	17.9		14.4		14.4				
1st Construction Costs	\$ 6,416	\$	7,963	\$	9,613				
PV of Capital Costs	\$ 6,416	\$	13,579	\$	15,123				
PV of Maintenance Costs	\$ -	\$	-	\$	-				
PV of Utility Costs	\$ 44,098	\$	35,652	\$	35,652				
Total Life Cycle Cost (LCC)	\$ 50,515	\$	49,231	\$	50,775				
Net Present Savings (NPS)	N/A	\$	1,283	\$	(261)				

Societal LCC takes into consideration the social cost of carbon dioxide emissions caused by operational energy consumption

(GHG) Social Life Cycle Cost	BEST								
GHG Impact from Utility Consumption		Baseline		Alt. 1		Alt. 2			
Tons of CO2e over Study Period		43		35		35			
% CO2e Reduction vs. Baseline		N/A		19%		24%			
Present Social Cost of Carbon (SCC)	\$	3,240	\$	2,619	\$	2,619			
Total LCC with SCC	\$	53,755	\$	51,851	\$	53,395			
NPS with SCC		N/A	\$	1,904	\$	360			





Medium Heat Pump Home – Baseline Input

	(Requires Level 1)	١,			and Click OK to Re-filter			1		
	f Financial Management		✓ Show A	All Entered	l Units (Requires Re-Filter	·)				
	ı, Washington - Version: 2020-A le Cost Analysis Tool							l		
•	ine Input Page			Total B	uilding Annual Utility Ar	nalysis	\$ 1,036	Water (CCF)	Electricity (KWH)	Natural Gas (Therms)
					Annual Utility	Bill [\$]		(ccr)	\$ 1,036	\$
				Ar	nnual Utility Consumption		,		11,513	
					Sum of Annual Utility Cor	nsumption Below				
					Total Annual Utility (11,513	
				Α	nnual Utility Bill ÷ Total U	tility Consumption		\$ -	\$ 0.09	\$
Bu	format II Elemental Classification for uildings (Building Component List)	REF	# of Units	Useful Life (Yrs.)	Installed Cost (\$/Unit)	1st Year Maintenance Cost (\$/Unit)	Total Component Installed Cost (\$'s)	Annual Water (CCF/Unit)	Annual Electricity (KWH/Unit)	Annual Natural Gas (Therm/Unit)
V	Primary Entries Below: # of Units must	he > 0 t	o be counter	d: Useful I	ife must be >= 2		\$ 6,558	Entries Beld	ow for Component :	Specific Utility A
A Subst	ructure						5,550	Entries being	- Sampariente	,
B Shell										
C Interi	iors									
D Servi	ces									
E Equip	ment & Furnishings									
F Speci	al Construction & Demolition									
G Build	ing Sitework									
X9010 Bu	uilding Envelope									
X901001	1.1 - U24 Glaze	0.5		50	\$1,789.84				-302	
X901002	1.2 - U20 Glaze	1		50	\$2,625.10				-492	
X901003	1.3 - 5% UA reduc	0.5		50	\$1,270.23				-59	
X901004	1.4 - 15% UA reduc	1		50	\$3,255.06				-528	
X901005	1.5 - 22.5% UA reduc	1.5		50	\$4,849.92				-817	
X901006	1.6 - 30% UA reduc	2.5		50	\$12,094.52				-1,158	
X901007	2.1 - 2 ACH, HRV	0.5		50	\$2,283.74				-105	
X901008	2.2 - 1.5 ACH, HRV	1		50	\$5,456.94				-504	
X901009	2.3 - 0.6 ACH, HRV	1.5		50	\$7,048.35				-762	
	VAC	-			4054.50					
X902001	3.1a - Furnace	1		18	\$251.59					
X902002	3.2a - 9.5 HSPF HP	0.5		15	\$1,387.73				-328	
X902003 X902004	3.3a - GSHP 3.4 - DHP	1.5		20 18	\$10,900.00 \$1,529.78					
X902004 X902005	3.5a - 11.0 HSPF HP	1.5		15	\$1,529.78				-980	
X902005 X902006	3.6a - DHP (15% elec)	2		18	\$1,529.78				-580	
X902006 X902007	4.1 - Deeply buried	0.5		50	\$0.00					
X902007	4.2 - HVAC inside	1		50	\$327.81				-666	
	ot Water	-		30	9327.01				000	
X903001	5.1 - DWR	0.5		50	\$437.08				-282	
X903002	5.2 - 0.80 gas DHW	0.5		15	\$640.32					
X903003	5.3 - 0.91 gas DHW, GSHP	1		15	\$1,008.56					
X903004	5.4 - Tier III HPWH	2		15	\$955.02				-1,761	
X903005	5.5 - CO2 HPWH	2.5		15	\$3,824.45				-1,916	
	ther									
X904001	6.1 - Solar pV	1		25	\$5,040.00					
× X904002	7.1 - ES Appl+ventless Dryer	0.5		15	\$504.83				-750	
x X9050 20	018 Compliant Building Cost		1	50	\$6,558.39		\$ 6,558			
X9060 Ac	dded Cost			55	\$0.75					
Z Other	r Project Costs									
Z10 One 1	Time - Upfront Costs		1	50						

Medium Heat Pump Home – ALT 1

	(Requires Level 1)				and Click OK to Re-filter	en v			i a			
	Financial Management		O Manua	Special S	Selection Only (Requires R	efilter)						
Olympia,	, Washington - Version: 2020-A		Show E	laseline F	ields and Entered Units (R	equires Refilter)						
Life Cvcl	e Cost Analysis Tool		O Show [ifference	es Between Alternative and	d Baseline (Req. R	efilter)					
0-8000	ative 1 Input Page			Total B	uilding Annual Utility An	alysis	\$	896	Water (CCF)	Electricity (KWH)	Natural Gas (Therms)	
					Annual Utility E	rži Ilis	1		(cci)	\$ 896	(memis)	
				Δr	inual Utility Consumption		v			13,396		
					Sum of Annual Utility Con		•			(3,443)		
					Total Annual Utility Co				_	9,953		
				А	nnual Utility Bill + Total Ut		ă .		\$ -	\$ 0.09	\$	
Note: No Ur	nits Assigned to a Component with Entries					-						
				Useful		1st Year	Total C	omponent			Annual	
Unifo	ormat II Elemental Classification for	REF	# of Units	Life	Installed Cost	Maintenance		lled Cost	Annual	Annual Electricity	Natural Ga	
Bui	ildings (Building Component List)	IXLF	# Of Offics	(Yrs.)	(\$/Unit)	Cost (\$/Unit)		(\$'s)	Water (CCF/Unit)	(KWH/Unit)	(Therm/Uni	
					030000 79	Cost (\$/Onit)		(\$ 5)		100 00 00	A STATE OF THE PARTY OF THE PAR	
	Primary Entries Below: # of Un	its mus	t be > 0 to b	e countec	; Useful Life must be >= 2				Entries Belo	w for Component	Specific Utility	
	e: Filter to Select All & Drag Copy 014:S14 & U14:AG14						\$	7,181				
A Substr	ructure											
B Shell												
C Interio												
D Service												
	ment & Furnishings											
	l Construction & Demolition											
	ng Sitework											
	llding Envelope											
	1.1 - U24 Glaze	0.5	1	50	\$1,789.84		\$	1,790		-301.5926795		
	1.2 - U20 Glaze	1		50	\$2,625.10					-492.3861265		
	1.3 - 5% UA reduc	0.5		50	\$1,270.23					-59.11484922		
	1.4 - 15% UA reduc	1		50	\$3,255.06					-528.041402		
	1.5 - 22.5% UA reduc	2		50	\$4,849.92					-817.1943594		
	1.6 - 30% UA reduc	3		50	\$12,094.52					-1157.67213		
	2.1 - 2 ACH, HRV	1	. 1	50	\$2,283.74		\$	2,284		-104.5804845		
	2.2 - 1.5 ACH, HRV	1.5		50	\$5,456.94					-504.2060427		
	2.3 - 0.6 ACH, HRV	2		50	\$7,048.35					-761.9789856		
	AC											
	3.1a - Furnace	1		18	\$251.59							
	3.2a - 9.5 HSPF HP	0.5		15	\$1,387.73		\$	1,388		-328.0623131		
	3.3a - GSHP	1.5		20	\$10,900.00							
	3.4 - DHP	1.5		18	\$1,529.78							
	3.5a - 11.0 HSPF HP	1		15	\$1,529.78					-979.6948553		
	3.6a - DHP (15% elec)	2		18	\$5,900.58							
	4.1 - Deeply buried	1		50								
	4.2 - HVAC inside	1.5	1	50	\$327.81		\$	328		-665.8185187		
	t Water											
	5.1 - DWR	0.5			\$437.08		\$	437		-281.5676614		
	5.2 - 0.80 gas DHW	0.5		15	\$640.32							
	5.3 - 0.91 gas DHW, GSHP	1		15	\$1,008.56			05-		4750.0445		
	5.4 - Tier III HPWH	2	1	15	\$955.02		\$	955		-1760.941903		
	5.5 - CO2 HPWH	2.5		15	\$3,824.45					-1916.158669		
X9040 Oth												
	6.1 - Solar pV	1		25	\$5,040.00		-					
	7.1 - ES Appl+ventless Dryer	0.5		15	\$504.83					-750.0634586		
	18 Compliant Building Cost			50	\$6,558.39							
	ded Cost			55	\$0.75							
	Project Costs											
Z10 One Ti	ime - Upfront Costs		1	50								

Medium Heat Pump Home – ALT 2

K E IMIN	1	y	- 15				-	v	**	^
Primary Filter (Requires Level 1)		Onen Brim	any Eilter	and Click OK to Re-filter						
				Selection Only (Requires R	ofiltor			1 .		
Office of Financial Management		_								
Olympia, Washington - Version: 2020-A		-		ields and Entered Units (R	· · · · · · · · · · · · · · · · · · ·					
Life Cycle Cost Analysis Tool		O Show D	oifference	es Between Alternative an	d Baseline (Req. Re	efilter)				
Alternative 2 Input Page			Total B	uilding Annual Utility An	alysis	\$	896	Water (CCF)	Electricity (KWH)	Natural Gas (Therms)
				Annual Utility I			\$ 896	\$		
			Ar	nnual Utility Consumption	Not Entered Belov	v		-	13,396	
				Sum of Annual Utility Con				-	(3,443)	
				Total Annual Utility C				-	9,953	
Note: No Units Assigned to a Component with Entries			Д	nnual Utility Bill ÷ Total Ut	tility Consumption			\$ -	\$ 0.09	\$
			Useful		1st Year	Total C	omponent			Annual
Uniformat II Elemental Classification for	REF	# of Units	Life	Installed Cost	Maintenance		lled Cost	Annual	Annual Electricity	Natural Gas
Buildings (Building Component List)	INLF	# Of Offics	(Yrs.)	(\$/Unit)	Cost (\$/Unit)		\$'s)	Water (CCF/Unit)	(KWH/Unit)	(Therm/Unit
N							2 3/			
Primary Entries Below: # of Uni	ts mus	t be > 0 to be	counted	d; Useful Life must be >= 2		_		Entries Belo	w for Component	Specific Utility /
Match Baseline: Filter to Select All & Drag Copy O14:S14 & U14:AG14						\$	8,831			
A Substructure						_				
B Shell						-				
C Interiors										
D Services						-				
E Equipment & Furnishings F Special Construction & Demolition						-				
						-				
G Building Sitework						-				
X9010 Building Envelope										
X901001 1.1 - U24 Glaze	0.5	1	50	\$1,790		\$	1,790		-302	
X901002 1.2 - U20 Glaze	1		50	\$2,625					-492	
X901003 1.3 - 5% UA reduc	0.5		50	\$1,270					-59	
X901004 1.4 - 15% UA reduc	1.5		50 50	\$3,255					-528	
X901005 1.5 - 22.5% UA reduc X901006 1.6 - 30% UA reduc	2.5		50	\$4,850					-817 -1158	
X901006 1.6 - 30% UA reduc X901007 2.1 - 2 ACH, HRV	0.5	1	50	\$12,095 \$2,284		s	2,284		-1158	
X901007 2.1 - 2 ACH, HRV X901008 2.2 - 1.5 ACH, HRV	0.5	1	50	\$5,457		3	2,264		-504	
X901008 2.2 - 1.3 ACH, HRV	1.5		50	\$7,048					-762	
X9020 HVAC	1.3		30	\$7,046					-702	
X902001 3.1a - Furnace	1		18	\$252						
X902002 3.2a - 9.5 HSPF HP	0.5	1	15	\$1,388		\$	1,388		-328	
X902002 3.2a - 9.3 H3FF HF X902003 3.3a - GSHP	1.5	1	20	\$10,900		ľ	1,500		-320	
X902004 3.4 - DHP	1.5		18	\$1,530						
X902005 3.5a - 11.0 HSPF HP	1.3		15	\$1,530					-980	
X902006 3.6a - DHP (15% elec)	2		18	\$5,901						
X902007 4.1 - Deeply buried	0.5		50	,5,502						
X902008 4.2 - HVAC inside	1	1	50	\$328		\$	328		-666	
X9030 Hot Water						T .				
X903001 5.1 - DWR	0.5	1	50	\$437		\$	437		-282	
X903002 5.2 - 0.80 gas DHW	0.5		15	\$640						
X903003 5.3 - 0.91 gas DHW, GSHP	1		15	\$1,009						
X903004 5.4 - Tier III HPWH	2	1	15	\$955		\$	955		-1761	
X903005 5.5 - CO2 HPWH	2.5		15	\$3,824					-1916	
X9040 Other										
X904001 6.1 - Solar pV	1		25	\$5,040						
X904002 7.1 - ES Appl+ventless Dryer	0.5		15	\$505					-750	
X9050 2018 Compliant Building Cost			50	\$6,558						
X9060 Added Cost		2200	55	\$1		\$	1,650			
Z Other Project Costs										
Z10 One Time - Upfront Costs		1	50							
Z30 Re-Occurring Annual Cost (Track Inflation)		1	1							

Medium Heat Pump Home – Expenditure Report Expenditure Report Page In Constant 2020 \$'s

	Cumulative	e Expenditur	e Sı	ummary	Annual E	Ξx	oenditure S	Su	mmary
Year	Baseline	Alt. 1		Alt. 2	Baseline		Alt. 1		Alt. 2
2020	\$ 6,558	\$ 7,181	\$	8,831	\$ 6,558	\$	7,181	\$	8,831
2021	\$ 7,605	\$ 8,086	\$	9,736	\$ 1,047	\$	905	\$	905
2022	\$ 8,652	\$ 8,992	\$	10,642	\$ 1,047	\$	905	\$	905
2023	\$ 9,710	\$ 9,906	\$	11,556	\$ 1,058	\$	914	\$	914
2024	\$ 10,768	\$ 10,820	\$	12,470	\$ 1,058	\$	914	\$	914
2025	\$ 11,847	\$ 11,754	\$	13,404	\$ 1,079	\$	933	\$	933
2026	\$ 12,948	\$ 12,705	\$	14,355	\$ 1,101	\$	952	\$	952
2027	\$ 14,049	\$ 13,657	\$	15,307	\$ 1,101	\$	952	\$	952
2028	\$ 15,150	\$ 14,609	\$	16,259	\$ 1,101	\$	952	\$	952
2029	\$ 16,251	\$ 15,561	\$	17,211	\$ 1,101	\$	952	\$	952
2030	\$ 17,352	\$ 16,513	\$	18,163	\$ 1,101	\$	952	\$	952
2031	\$ 18,464	\$ 17,474	\$	19,124	\$ 1,112	\$	961	\$	961
2032	\$ 19,564	\$ 18,425	\$	20,075	\$ 1,101	\$	952	\$	952
2033	\$ 20,665	\$ 19,377	\$	21,027	\$ 1,101	\$	952	\$	952
2034	\$ 21,766	\$ 20,329	\$	21,979	\$ 1,101	\$	952	\$	952
2035	\$ 22,867	\$ 23,624	\$	25,274	\$ 1,101	\$	3,295	\$	3,295
2036	\$ 23,957	\$ 24,566	\$	26,216	\$ 1,090	\$	942	\$	942
2037	\$ 25,048	\$ 25,509	\$	27,159	\$ 1,090	\$	942	\$	942
2038	\$ 26,127	\$ 26,442	\$	28,092	\$ 1,079	\$	933	\$	933
2039	\$ 27,206	\$ 27,375	\$	29,025	\$ 1,079	\$	933	\$	933
2040	\$ 28,275	\$ 28,299	\$	29,949	\$ 1,069	\$	924	\$	924
2041	\$ 29,343	\$ 29,222	\$	30,872	\$ 1,069	\$	924	\$	924
2042	\$ 30,401	\$ 30,137	\$	31,787	\$ 1,058	\$	914	\$	914
2043	\$ 31,459	\$ 31,051	\$	32,701	\$ 1,058	\$	914	\$	914
2044	\$ 32,506	\$ 31,957	\$	33,607	\$ 1,047	\$	905	\$	905
2045	\$ 33,553	\$ 32,862	\$	34,512	\$ 1,047	\$	905	\$	905
2046	\$ 34,600	\$ 33,767	\$	35,417	\$ 1,047	\$	905	\$	905
2047	\$ 35,647	\$ 34,672	\$	36,322	\$ 1,047	\$	905	\$	905
2048	\$ 36,683	\$ 35,568	\$	37,218	\$ 1,036	\$	896	\$	896
2049	\$ 37,719	\$ 36,464	\$	38,114	\$ 1,036	\$	896	\$	896
2050	\$ 38,744	\$ 39,693	\$	41,343	\$ 1,025	\$	3,229	\$	3,229
2051	\$ 39,768	\$ 40,577	\$	42,227	\$ 1,023	\$	885	\$	885
2052	\$ 40,789	\$ 41,460	\$	43,110	\$ 1,021	\$	883	\$	883
2053	\$ 41,808	\$ 42,341	\$	43,991	\$ 1,019	\$	881	\$	881
2054	\$ 42,824	\$ 43,220	\$	44,870	\$ 1,017	\$	879	\$	879
2055	\$ 43,839	\$ 44,097	\$	45,747	\$ 1,015	\$	877	\$	877
2056	\$ 44,851	\$ 44,972	\$	46,622	\$ 1,012	\$	875	\$	875
2057	\$ 45,862	\$ 45,846	\$	47,496	\$ 1,010	\$	873	\$	873
2058	\$ 46,870	\$ 46,717	\$	48,367	\$ 1,008	\$	872	\$	872
2059	\$ 47,876	\$ 47,587	\$	49,237	\$ 1,006	\$	870	\$	870
2060	\$ 48,879	\$ 48,455	\$	50,105	\$ 1,004	\$	868	\$	868
2061	\$ 49,881	\$ 49,321	\$	50,971	\$ 1,002	\$	866	\$	866
2062	\$ 50,881	\$ 50,185	\$	51,835	\$ 999	\$	864	\$	864
2063	\$ 51,878	\$ 51,047	\$	52,697	\$ 997	\$	862	\$	862
2064	\$ 52,873	\$ 51,908	\$	53,558	\$ 995	\$	860	\$	860
2065	\$ 53,866	\$ 55,109	\$	56,759	\$ 993		3,201	\$	3,201
2066	\$ 54,857	\$ 55,965	\$	57,615	\$ 991	\$	857	\$	857
2067	\$ 55,846	\$ 56,820	\$	58,470	\$ 989	\$	855	\$	855
2068	\$ 56,832	\$ 57,673	\$	59,323	\$ 987	\$	853	\$	853
2069	\$ 57,816	\$ 58,524	\$	60,174	\$ 984	-	851	\$	851
2070	\$ 58,799	\$ 57,811	\$	59,311	\$ 982	\$	(713)	\$	(863)

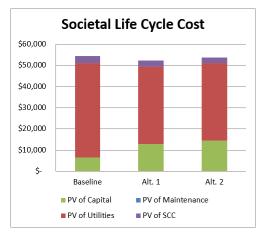
Medium Zonal Electric Home – Executive Report

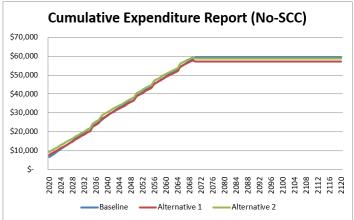
Key Analysis Va	riables	Building Ch	aracteristics
Study Period (years)	50	Gross (Sq.Ft)	2,200
Nominal Discount Rate	3.14%	Useable (Sq.Ft)	2,200
Maintenance Escalation	1.00%	Space Efficiency	100.0%
Zero Year (Current Year)	2020	Project Phase	0
Construction Years	0	Building Type	0

Life Cycle Cost Analysis	BEST										
Alternative	Baseline		Alt. 1		Alt. 2						
Energy Use Intenstity (kBtu/sq.ft)	18.0		14.8		14.8						
1st Construction Costs	\$ 6,558	\$	7,778	\$	9,428						
PV of Capital Costs	\$ 6,558	\$	12,956	\$	14,500						
PV of Maintenance Costs	\$ =	\$	=	\$	=						
PV of Utility Costs	\$ 44,513	\$	36,544	\$	36 <mark>,</mark> 544						
Total Life Cycle Cost (LCC)	\$ 51,072	\$	49,500	\$	51,044						
Net Present Savings (NPS)	N/A	\$	1,572	\$	27						

Societal LCC takes into consideration the social cost of carbon dioxide emissions caused by operational energy consumption

(GHG) Social Life Cycle Cost	BEST					
GHG Impact from Utility Consumption	Baseline		Alt. 1		Alt. 2	
Tons of CO2e over Study Period	43		35		35	
% CO2e Reduction vs. Baseline	N/A		18%		22%	
Present Social Cost of Carbon (SCC)	\$ 3,271	\$	2,685	\$	2,685	
Total LCC with SCC	\$ 54,342	\$	52,185	\$	53,729	
NPS with SCC	N/A	\$	2,157	\$	613	





<u>Medium Zonal Electric Home – Baseline Input</u>

	er (Requires Level 1)	,	•		and Click OK to Re-filter Units (Requires Re-Filter		,			
Olympi	of Financial Management a, Washington - Version: 2020-A cle Cost Analysis Tool		Snow A	ui Enterea	l					
Base	line Input Page			Total B	uilding Annual Utility Ar	nalysis	\$ 1,046	Water (CCF)	Electricity (KWH)	Natural Gas (Therms)
					Annual Utility	Bill [\$]		,,	\$ 1,046	\$ -
				An	nual Utility Consumption	Not Entered Below	1		11,621	
					Sum of Annual Utility Co			-	-	-
					Total Annual Utility (-	11,621		
		+	•		nnual Utility Bill ÷ Total U	tility Consumption		\$ -	\$ 0.09	\$ -
H	iformat II Elemental Classification for uildings (Building Component List)	REF	# of Units	Useful Life (Yrs.)	Installed Cost (\$/Unit)	1st Year Maintenance Cost (\$/Unit)	Total Component Installed Cost (\$'s)	Annual Water (CCF/Unit)	Annual Electricity (KWH/Unit)	Annual Natural Gas (Therm/Unit)
***	Primary Entries Below: # of Units must	be > 0 t	o be counted	d; Useful L	ife must be >= 2		\$ 6,558	Entries Belo	w for Component :	specific Utility Ana
A Subs	structure									
B Shel										
C Inte										
D Serv										
	ipment & Furnishings									
	cial Construction & Demolition									
	ding Sitework									
	Building Envelope	0.5		50	Ć4 700 04				-348	
x X901001 x X901002	1.1 - U24 Glaze 1.2 - U20 Glaze	0.5		50	\$1,789.84 \$2,625.10				-348 -597	
x X901002 x X901003	1.3 - 5% UA reduc	0.5		50	\$1,270.23				-122	
x X901003	1.4 - 15% UA reduc	1		50	\$3,255.06				-648	
x X901005	1.5 - 22.5% UA reduc	1.5		50	\$4,849.92				-1.015	
x X901006	1.6 - 30% UA reduc	2.5		50	\$12,094.52				-1,456	
x X901007	2.1 - 2 ACH, HRV	0.5		50	\$2,283.74				-111	
× X901008	2.2 - 1.5 ACH, HRV	1		50	\$5,456.94				-664	
x X901009	2.3 - 0.6 ACH, HRV	1.5		50	\$7,048.35				-997	
x X9020 F	HVAC									
x X902001	3.1a - Furnace	1		18	\$251.59					
x X902002	3.2a - 9.5 HSPF HP	0.5		15	\$1,387.73					
x X902003	3.3a - GSHP	1.5		20	\$10,900.00					
x X902004	3.4 - DHP	1.5		18	\$1,529.78				-1,129	
x X902005	3.5a - 11.0 HSPF HP	2		15 18	\$1,529.78				2.105	
x X902006 x X902007	3.6a - DHP (15% elec) 4.1 - Deeply buried	0.5		18 50	\$5,900.58 \$0.00				-2,185	
x X902007 x X902008	4.1 - Deeply buried 4.2 - HVAC inside	1		50	\$327.81					
	Hot Water	-		30	J327.01					
x X903001	5.1 - DWR	0.5		50	\$437.08				-318	
x X903002	5.2 - 0.80 gas DHW	0.5		15	\$640.32					
x X903003	5.3 - 0.91 gas DHW, GSHP	1		15	\$1,008.56					
x X903004	5.4 - Tier III HPWH	2		15	\$955.02				-1,790	
x X903005	5.5 - CO2 HPWH	2.5		15	\$3,824.45				-1,941	
	Other									
x X904001	6.1 - Solar pV	1		25	\$5,040.00					
x X904002	7.1 - ES Appl+ventless Dryer	0.5		15	\$504.83				-776	
	2018 Compliant Building Cost		1	50	\$6,558.39		\$ 6,558			
	Added Cost			55 50	\$0.75					
	BACH & Continuous Insulation er Project Costs			50	\$2,561.00					
	· ·		1	50						
	Time - Upfront Costs Occurring Annual Cost (Track Inflation)		1	50						

Medium Zonal Electric Home – ALT 1

rimary Filter (Requires Level 1)		Onen Prima	ary Filter	and Click OK to Re-filter								
Office of Financial Management				Selection Only (Requires R	ofiltor)							
The state of the control of the state of the			- 10									
Olympia, Washington - Version: 2020-A				ields and Entered Units (R								
Life Cycle Cost Analysis Tool		O Show E	Differenc	es Between Alternative and	d Baseline (Req. Re	efilter)			1			
Alternative 1 Input Page			Total B	uilding Annual Utility An		\$	859	Water (CCF)	Electricity (KWH)	Natural Gas (Therms)		
				Annual Utility E	Bill [\$]				\$ 859			
				nnual Utility Consumption		v			13,901			
				Sum of Annual Utility Con				-	(4,360)			
				Total Annual Utility Co					9,541			
Note: No Unite Assigned to a Component with Entries				Annual Utility Bill ÷ Total Ut	ility Consumption			\$ -	\$ 0.09	\$		
Note: No Units Assigned to a Component with Entries						I						
Uniformat II Elemental Classification for			Useful	Installed Cost	1st Year		mponent	Annual	Annual Electricity	Annual		
Buildings (Building Component List)	REF	# of Units	Life	(\$/Unit)	Maintenance	200000000000000000000000000000000000000	led Cost	Water (CCF/Unit)		Natural Gas		
Buildings (Building Component List)			(Yrs.)	(O) Oline)	Cost (\$/Unit)	(:	\$'s)	Water (ceryonic)	(KWTI) OTHE)	(Therm/Unit)		
Primary Entries Below: # of Uni	ts must	t be > 0 to be	e counte	d; Useful Life must be >= 2				Entries Belo	w for Component	Specific Utility A		
Match Baseline: Filter to Select All & Drag Copy O14:S14 & U14:AG14						\$	7,778					
A Substructure												
B Shell												
C Interiors												
D Services												
E Equipment & Furnishings												
F Special Construction & Demolition												
G Building Sitework												
X9010 Building Envelope							LANGE BOOK OF THE PARTY OF THE					
X901001 1.1 - U24 Glaze	0.5	1	50	\$1,790		\$	1,790		-348			
X901002 1.2 - U20 Glaze	1		50	\$2,625					-597			
X901003 1.3 - 5% UA reduc	0.5		50	\$1,270					-122			
X901004 1.4 - 15% UA reduc	1		50	\$3,255					-648			
X901005 1.5 - 22.5% UA reduc	2		50	\$4,850					-1015	2		
X901006 1.6 - 30% UA reduc	3		50	\$12,095					-1456			
X901007 2.1 - 2 ACH, HRV	1.5		50 50	\$2,284					-111 -664			
X901008 2.2 - 1.5 ACH, HRV X901009 2.3 - 0.6 ACH, HRV	1.5		50	\$5,457					-997	-		
X901009 2.3 - 0.6 ACH, HRV X9020 HVAC			50	\$7,048		-			-997			
X902001 3.1a - Furnace	1		18	\$252		-						
X902001 3.1a - Furnace X902002 3.2a - 9.5 HSPF HP	0.5		15	\$1,388								
X902002 3.2a - 9.5 HSPF HP X902003 3.3a - GSHP	1.5		20	\$1,388								
X902004 3.4 - DHP	1.5	1	18	\$1,530		\$	1,530		-1129			
X902005 3.5a - 11.0 HSPF HP	1.3		15	\$1,530		Ť	1,550		1123			
X902006 3.6a - DHP (15% elec)	2		18	\$5,901					-2185			
X902007 4.1 - Deeply buried	1		50	+5)501								
X902008 4.2 - HVAC inside	1.5		50	\$328								
X9030 Hot Water												
X903001 5.1 - DWR	0.5	1	50	\$437		\$	437		-318			
X903002 5.2 - 0.80 gas DHW	0.5		15	\$640								
X903003 5.3 - 0.91 gas DHW, GSHP	1		15	\$1,009								
X903004 5.4 - Tier III HPWH	2	1	15	\$955		\$	955		-1790			
X903005 5.5 - CO2 HPWH	2.5		15	\$3,824					-1941			
X9040 Other												
X904001 6.1 - Solar pV	1		25	\$5,040								
X904002 7.1 - ES Appl+ventless Dryer	0.5	1	15	\$505		\$	505		-776			
X9050 2018 Compliant Building Cost			50	\$6,558								
X9060 Added Cost			55	\$0.75								
X9070 3ACH & Continuous Insulation		1	50	\$2,561		\$	2,561					
Z Other Project Costs												
Z Other Project costs			50									

Medium Zonal Electric Home – ALT 2

<- Pr	imary Filter (Requires Level 1)		Open Prima	ry Filter	and Click OK to Re-filter						
	Office of Financial Management		O Manual	Special S	election Only (Requires R	efilter)			1		
	Olympia, Washington - Version: 2020-A	i			elds and Entered Units (R	70.					
	Life Cycle Cost Analysis Tool				s Between Alternative and		filtor)				
	Alternative 2 Input Page		O SHOW D		uilding Annual Utility Ana		S	859	Water	Electricity (KWH)	Natural Gas
	Alternative 2 iliput Page			Total D			->	633	(CCF)		(Therms)
					Annual Utility E					\$ 859	
					nual Utility Consumption		V		-	13,901	
					Sum of Annual Utility Con				-	(4,360)	15
					Total Annual Utility Co		_		-	9,541	-
	Note: No Units Assigned to a Component with Entries			А	nnual Utility Bill ÷ Total Ut	ility Consumption			\$ -	\$ 0.09	\$ -
	Note. No offits Assigned to a Component with Entires										
S	Uniformat II Elemental Classification for			Useful	Installed Cost	1st Year		Component	Annual	Annual Electricity	Annual
Н	Buildings (Building Component List)	REF	# of Units	Life	(\$/Unit)	Maintenance		alled Cost	Water (CCF/Unit)		Natural Gas
o W	Buildings (Building Component List)			(Yrs.)	(777	Cost (\$/Unit)		(\$'s)	(,,	(,,	(Therm/Unit)
	Primary Entries Below: # of Units	s must	be > 0 to be	counted	; Useful Life must be >= 2				Entries Belo	w for Component	Specific Utility Anal
	Match Baseline: Filter to Select All & Drag Copy O14:S14 & U14:AG14						\$	9,428			
	A Substructure										
-	B Shell										
	C Interiors										
_	D Services										
	E Equipment & Furnishings										
	F Special Construction & Demolition										
-	G Building Sitework						-				
	X9010 Building Envelope										
	X901001 1.1 - U24 Glaze	0.5	1	50	\$1,790		\$	1,790		-348	
	X901002 1.2 - U20 Glaze	1		50	\$2,625		_			-597	
	X901003 1.3 - 5% UA reduc	0.5		50	\$1,270		_			-122	
	X901004 1.4 - 15% UA reduc	1		50	\$3,255		_			-648	
-	X901005 1.5 - 22.5% UA reduc	1.5 2.5	-	50 50	\$4,850			je.		-1015 -1456	
-	X901006	0.5		50	\$12,095 \$2,284		_			-1456	
	X901007 2.1 - 2 ACH, HRV X901008 2.2 - 1.5 ACH, HRV	0.5		50	\$2,284		_			-664	
	X901008 2.2 - 1.5 ACH, HRV X901009 2.3 - 0.6 ACH, HRV	1.5		50	\$7,048		-			-997	
\rightarrow	X9020 HVAC	1.5		30	\$7,040		-			-551	
-	X902001 3.1a - Furnace	1		18	\$252						
	X902002 3.2a - 9.5 HSPF HP	0.5		15	\$1,388						
	X902003 3.3a - GSHP	1.5		20	\$10,900		l -				
-	X902004 3.4 - DHP	1.5	1	18	\$1,530		\$	1,530		-1129	
	X902005 3.5a - 11.0 HSPF HP	1		15	\$1,530		-	-/			
	X902006 3.6a - DHP (15% elec)	2		18	\$5,901					-2185	
	X902007 4.1 - Deeply buried	0.5		50							
	X902008 4.2 - HVAC inside	1		50	\$328						
	X9030 Hot Water										
-	X903001 5.1 - DWR	0.5	1	50	\$437		\$	437		-318	
-	X903002 5.2 - 0.80 gas DHW	0.5		15	\$640						
-	X903003 5.3 - 0.91 gas DHW, GSHP	1		15	\$1,009						
-	X903004 5.4 - Tier III HPWH	2	1	15	\$955		\$	955		-1790	
-	X903005 5.5 - CO2 HPWH	2.5		15	\$3,824					-1941	
	X9040 Other										
	X904001 6.1 - Solar pV	1		25	\$5,040						
-	X904002 7.1 - ES Appl+ventless Dryer	0.5	1	15	\$505		\$	505		-776	
-	X9050 2018 Compliant Building Cost			50	\$6,558						
-	X9060 Added Cost		2200	55	\$0.75		\$	1,650			
-	X9070 3ACH & Continuous Insulation		1	50	\$2,561		\$	2,561			
-	Z Other Project Costs										
-	Z10 One Time - Upfront Costs		1	50							
	Z30 Re-Occurring Annual Cost (Track Inflation)		1	1							

Medium Zonal Electric Home-Expenditure Report Expenditure Report Page In Constant 2020 \$'s

Year 2020 \$ 2021 \$ 2022 \$ 2023 \$ 2024 \$ 2025 \$ 2026 \$	Baseline 6,558 7,615 8,672 9,740	Alt. 1 \$ 7,778	Alt. 2				
2021 \$ 2022 \$ 2023 \$ 2024 \$ 2025 \$	7,615 8,672		AIG Z	Baseline		Alt. 1	Alt. 2
2022 \$ 2023 \$ 2024 \$ 2025 \$	8,672	Ć 0.645	\$ 9,428	\$ 6,558	\$	7,778	\$ 9,428
2023 \$ 2024 \$ 2025 \$		\$ 8,645	\$ 10,295	\$ 1,057	\$	868	\$ 868
2024 \$ 2025 \$	9,740	\$ 9,513	\$ 11,163	\$ 1,057	\$	868	\$ 868
2025 \$		\$ 10,389	\$ 12,039	\$ 1,068	\$	877	\$ 877
	10,807	\$ 11,266	\$ 12,916	\$ 1,068	\$	877	\$ 877
2026 \$	11,897	\$ 12,160	\$ 13,810	\$ 1,090	\$	894	\$ 894
	13,008	\$ 13,073	\$ 14,723	\$ 1,111	\$	912	\$ 912
2027 \$	14,120	\$ 13,985	\$ 15,635	\$ 1,111	\$	912	\$ 912
2028 \$	15,231	\$ 14,897	\$ 16,547	\$ 1,111	\$	912	\$ 912
2029 \$	16,342	\$ 15,810	\$ 17,460	\$ 1,111	\$	912	\$ 912
2030 \$	17,453	\$ 16,722	\$ 18,372	\$ 1,111	\$	912	\$ 912
2031 \$	18,576	\$ 17,643	\$ 19,293	\$ 1,122	\$	921	\$ 921
2032 \$	19,687	\$ 18,556	\$ 20,206	\$ 1,111	\$	912	\$ 912
2033 \$	20,798	\$ 19,468	\$ 21,118	\$ 1,111	\$	912	\$ 912
2034 \$	21,909	\$ 20,380	\$ 22,030	\$ 1,111	\$	912	\$ 912
2035 \$	23,021	\$ 22,753	\$ 24,403	\$ 1,111	\$	2,372	\$ 2,372
2036 \$	24,121	\$ 23,656	\$ 25,306	\$ 1,100	\$	903	\$ 903
2037 \$	25,222	\$ 24,559	\$ 26,209	\$ 1,100	\$	903	\$ 903
2038 \$	26,311	\$ 26,984	\$ 28,634	\$ 1,090	\$	2,424	\$ 2,424
2039 \$	27,401	\$ 27,878	\$ 29,528	\$ 1,090	\$	894	\$ 894
2040 \$	28,479	\$ 28,764	\$ 30,414	\$ 1,079	\$	886	\$ 886
2041 \$	29,558	\$ 29,649	\$ 31,299	\$ 1,079	\$	886	\$ 886
2042 \$	30,625	\$ 30,526	\$ 32,176	\$ 1,068	\$	877	\$ 877
2043 \$	31,693	\$ 31,402	\$ 33,052	\$ 1,068	\$	877	\$ 877
2044 \$	32,750	\$ 32,270	\$ 33,920	\$ 1,057	\$	868	\$ 868
2045 \$	33,807	\$ 33,137	\$ 34,787	\$ 1,057	\$	868	\$ 868
2046 \$	34,864	\$ 34,005	\$ 35,655	\$ 1,057	\$	868	\$ 868
2047 \$	35,920	\$ 34,873	\$ 36,523	\$ 1,057	\$	868	\$ 868
2048 \$	36,966	\$ 35,731	\$ 37,381	\$ 1,046	\$	859	\$ 859
2049 \$	38,012	\$ 36,590	\$ 38,240	\$ 1,046	\$	859	\$ 859
2050 \$	39,047	\$ 38,900	\$ 40,550	\$ 1,035	\$	2,310	\$ 2,310
2051 \$	40,080	\$ 39,747	\$ 41,397	\$ 1,033	\$	848	\$ 848
2052 \$	41,111	\$ 40,594	\$ 42,244	\$ 1,031	\$	846	\$ 846
2053 \$	42,139	\$ 41,438	\$ 43,088	\$ 1,028	\$	844	\$ 844
2054 \$	43,166	\$ 42,281	\$ 43,931	\$ 1,026	\$	843	\$ 843
2055 \$	44,190	\$ 43,121	\$ 44,771	\$ 1,024	\$	841	\$ 841
2056 \$	45,212	\$ 45,490	\$ 47,140	\$ 1,022	\$	2,369	\$ 2,369
2057 \$	46,231	\$ 46,327	\$ 47,977	\$ 1,020	\$	837	\$ 837
2058 \$	47,249	\$ 47,163	\$ 48,813	\$ 1,018	_	835	\$ 835
2059 \$	48,264	\$ 47,996	\$ 49,646	\$ 1,015	_	834	\$ 834
2060 \$	49,278	\$ 48,828	\$ 50,478	\$ 1,013		832	\$ 832
2061 \$	50,289	\$ 49,658	\$ 51,308	\$ 1,011	_	830	\$ 830
2062 \$	51,298	\$ 50,486	\$ 52,136	\$ 1,009		828	\$ 828
2063 \$	52,304	\$ 51,313	\$ 52,963	\$ 1,007	\$	826	\$ 826
2064 \$	53,309	\$ 52,138	\$ 53,788	\$ 1,005	\$	825	\$ 825
2065 \$	54,311	\$ 54,420	\$ 56,070	\$ 1,002	\$	2,283	\$ 2,283
2066 \$	55,311	\$ 55,241	\$ 56,891	\$ 1,000	\$	821	\$ 821
2067 \$	56,309	\$ 56,061	\$ 57,711	\$ 998	\$	819	\$ 819
2068 \$	57,305	\$ 56,878	\$ 58,528	\$ 996	\$	818	\$ 818
2069 \$	58,299	\$ 57,694	\$ 59,344	\$ 994	\$	816	\$ 816
2070 \$	59,290	\$ 57,195	\$ 58,695	\$ 991	\$	(499)	(649)

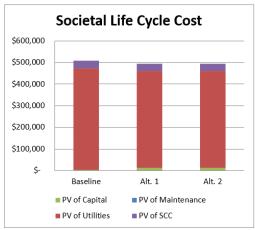
<u>Multifamily Zonal Electric Home – Executive Report</u>

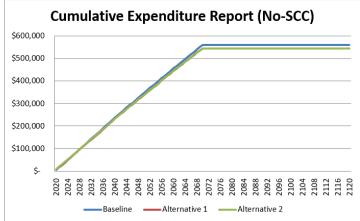
Key Analysis Var	iables	Building Characteristics					
Study Period (years)	50	Gross (Sq.Ft)	820				
Nominal Discount Rate	3.14%	Useable (Sq.Ft)	820				
Maintenance Escalation	1.00%	Space Efficiency	100.0%				
Zero Year (Current Year)	2020	Project Phase	0				
Construction Years	0	Building Type	0				

Life Cycle Cost Analysis						
Alternative		Baseline		Alt. 1		Alt. 2
Energy Use Intenstity (kBtu/sq.ft)		510.6		487.2		487.2
1st Construction Costs	\$	3,911	\$	7,224	\$	7,839
PV of Capital Costs	\$	3,911	\$	12,450	\$	13,026
PV of Maintenance Costs	\$	-	\$	-	\$	-
PV of Utility Costs	\$	469,980	\$	448,485	\$	448,485
Total Life Cycle Cost (LCC)	\$	473,890	\$	460,935	\$	461,511
Net Present Savings (NPS)		N/A	\$	12,955	\$	12,379

Societal LCC takes into consideration the social cost of carbon dioxide emissions caused by operational energy consumption

(GHG) Social Life Cycle Cost	BEST									
GHG Impact from Utility Consumption	Baseline		Alt. 1		Alt. 2					
Tons of CO2e over Study Period	455		434		434					
% CO2e Reduction vs. Baseline	N/A		5%		5%					
Present Social Cost of Carbon (SCC)	\$ 34,531	\$	32,951	\$	32,951					
Total LCC with SCC	\$ 508,421	\$	493,887	\$	494,462					
NPS with SCC	N/A	\$	14,534	\$	13,959					





Multifamily Zonal Electric Home - Baseline Input

<- Primary Filter (Requires Level	1)		Open Prima	ary Filter	and Click OK to Re-filter						
Office of Financial	_		✓ Show A	II Entered	Units (Requires Re-Filter)			11111111111		
	on - Version: 2020-A								10000000		
Life Cycle Cost Ana	=						•		Water	I	Natural Gas
Baseline Inpu	t Page			Total B	uilding Annual Utility An	alysis	\$	11,043	(CCF)	Electricity (KWH)	(Therms)
					Annual Utility	Bill [\$]	-		(22.7	\$ 11,043	\$ -
					nual Utility Consumption		/			122,700	
					Sum of Annual Utility Cor				-	-	-
				Λ	Total Annual Utility C nnual Utility Bill ÷ Total U				\$ -	122,700 \$ 0.09	\$ -
		•			inidal othicy bill + Total o				Ş -	\$ 0.09	
s Uniformat II Elei	mental Classification for	200		Useful	Installed Cost	1st Year	1	mponent	Annual	Annual Electricity	Annual
Buildings (Bui	Iding Component List)	REF	# of Units	Life (Yrs.)	(\$/Unit)	Maintenance Cost (\$/Unit)	1	led Cost \$'s)	Water (CCF/Unit)	(KWH/Unit)	Natural Gas (Therm/Unit)
w	,					Cost (\$/Onit)					
	Primary Entries Below: # of Units must b	e > 0 to	o be counted	l; Useful L	ife must be >= 2		\$	3,911	Entries Belo	w for Component	Specific Utility Ana
A Substructure B Shell											
C Interiors											
D Services											
E Equipment & Furnish	ings										
F Special Construction											
G Building Sitework											
x X9010 Building Envelope											
x X901001 1.1 - U24 Glaz		0.5		50	\$0.00					-132	
x X901002 1.2 - U20 Glaz		1		50	\$887.05					-263	
x X901003 1.3 - 5% UA rec				50	\$173.23					34	
x X901004 1.4 - 15% UA re		1		50	\$946.79					-223	
x X901005 1.5 - 22.5% UA x X901006 1.6 - 30% UA re		1.5		50 50	\$1,382.85 \$3,779.14					-420 -555	
x X901008 1.6 - 30% 0A 16 x X901007 2.1 - 2 ACH, HR		0.5		50	\$851.21					-329	
x X901007 2.1 2 ACH, H		1		50	\$2,033.95					-642	
x X901009 2.3 - 0.6 ACH, F		1.5		50	\$2,627.11					-934	
x X9020 HVAC					, .,						
x X902001 3.1a - Furnace		1		18	\$251.59						
x X902002 3.2a - 9.5 HSPF	HP			15	\$0.00						
x X902003 3.3a - GSHP		1		20	\$0.00						
x X902004 3.4 - DHP	F.110	2		18	\$3,059.56					41	
x X902005 3.5a - 11.0 HSP x X902006 3.6a - DHP (159		3		15 18	\$0.00 \$5,244.96					-740	
x X902006 3.6a - DHP (159 x X902007 4.1 - Deeply bu		0.5		50	\$5,244.96					-740	
x X902007 4.1 - Deeply bu x X902008 4.2 - HVAC insid				50	\$0.00						
x X9030 Hot Water				50	VO.00						
x X903001 5.1 - DWR				50	\$504.83					-182	
x X903002 5.2 - 0.80 gas E	DHW	0.5		15	\$0.00						
x X903003 5.3 - 0.91 gas E		1		15	\$0.00						
x X903004 5.4 - Tier III HP		2.5		15	\$318.34					-973	
x X903005 5.5 - CO2 HPW	Н	3		15	\$1,274.82					-1,055	
x X9040 Other		4		25	ĆE 040 00						
x X904001 6.1 - Solar pV x X904002 7.1 - ES Appl+vo	antlace Dryar	1.5		25 15	\$5,040.00 \$504.83					-629	
x X904002 7.1 - ES Appi+Vi		1.5	1	50	\$3,910.77		S	3,911		-029	
x X9060 Added Cost	moning cost		-	55	\$0.75		ľ	3,711			
x X9070 3ACH & Continuou	is Insulation			50	\$865.00						
Z Other Project Costs	•										
Z10 One Time - Upfront Co	osts		1	50							
Z30 Re-Occurring Annual	Cost (Track Inflation)		1	1							

Multifamily Zonal Electric Home – ALT 1

				-						_				
		er (Requires Level 1)				and Click OK to Re-filter								
		of Financial Management		-		Selection Only (Requires R								
	Olympi	ia, Washington - Version: 2020-A		Show B	Baseline F	ields and Entered Units (Re								
	Life Cy	cle Cost Analysis Tool		O Show D	Difference	es Between Alternative and								
	Alter	native 1 Input Page			Total B	uilding Annual Utility Ana	alysis	\$	10,538	Water (CCF)	Electricity (KWH)	Natural Gas (Therms)		
						Annual Utility B	Bill [\$]			(00.7	\$ 10,538	(Titerino)		
					Aı	nnual Utility Consumption		118,885						
						Sum of Annual Utility Con-	1	(1,797)	-					
						Total Annual Utility Co					- 117,088			
					F	nnual Utility Bill ÷ Total Ut	ility Consumption			\$ -	\$ 0.09	\$ -		
	Note: No	Units Assigned to a Component with Entries						_						
s	Un	iformat II Elemental Classification for		ALAN - ALAN - 10	Useful	Installed Cost	1st Year	0.000 \$300.00	Component	Annual	Annual Electricity	Annual		
н		Buildings (Building Component List)	REF	# of Units	Life	(\$/Unit)	Maintenance	0.000.000	alled Cost	Water (CCF/Unit)		Natural Gas		
o w		dudings (Building Component List)			(Yrs.)	(477	Cost (\$/Unit)		(\$'s)	(,	(,)	(Therm/Unit)		
		Primary Entries Below: # of Un	ts mus	t be > 0 to be	e counte	d; Useful Life must be >= 2				Entries Belo	w for Component S	Specific Utility Analy		
		eline: Filter to Select All & Drag Copy O14:S14 & U14:AG14						\$	7,224					
		structure												
	B She													
		eriors												
	-	vices						-						
		ipment & Furnishings												
		cial Construction & Demolition												
		Building Envelope						-						
	X901001	1.1 - U24 Glaze	0.5		50						-132			
	X901001	1.2 - U20 Glaze	1		50	\$887.05					-263			
	X901003	1.3 - 5% UA reduc			50	\$173.23					34			
	X901004	1.4 - 15% UA reduc	1	1	50	\$946.79		\$	947		-223			
	X901005	1.5 - 22.5% UA reduc	1.5		50	\$1,382.85					-420			
	X901006	1.6 - 30% UA reduc	2		50						-555			
	X901007	2.1 - 2 ACH, HRV	0.5		50	\$851.21					-329			
	X901008	2.2 - 1.5 ACH, HRV	1	1		\$2,033.95		\$	2,034		-642			
	X901009	2.3 - 0.6 ACH, HRV	1.5		50	\$2,627.11					-934			
		HVAC			40	6354.50								
	X902001	3.1a - Furnace	1		18 15	\$251.59	2							
	X902002 X902003	3.2a - 9.5 HSPF HP 3.3a - GSHP	1		20									
	X902003	3.4 - DHP	2	1		\$3,059.56		\$	3,060		41			
	X902005	3.5a - 11.0 HSPF HP			15	\$3,033.30		-	5,000		12			
	X902006	3.6a - DHP (15% elec)	3		18	\$5,244.96					-740			
	X902007	4.1 - Deeply buried	0.5		50									
	X902008	4.2 - HVAC inside			50									
		Hot Water												
	X903001	5.1 - DWR			50	\$504.83					-182			
	X903002	5.2 - 0.80 gas DHW	0.5		15									
	X903003	5.3 - 0.91 gas DHW, GSHP	1		15				24-		070			
	X903004 X903005	5.4 - Tier III HPWH 5.5 - CO2 HPWH	2.5	1	15 15			\$	318		-973 -1055			
		Other	3		15	\$1,274.82					-1055			
	X904001	6.1 - Solar pV	1		25	\$5,040.00			h					
	X904001	7.1 - ES Appl+ventless Dryer	1.5		15						-629			
		2018 Compliant Building Cost			50									
		Added Cost			55	\$0.75								
		3ACH & Continuous Insulation		1	50	\$865.00		\$	865					
	Z Oth	er Project Costs												
		Time - Upfront Costs		1	50									
	Z30 Re-	Occurring Annual Cost (Track Inflation)		1	1									

Multifamily Zonal Electric Home – ALT 2

<- Prim	<- Primary Filter (Requires Level 1)			ary Filter	and Click OK to Re-filter						
0	ffice of Financial Management		O Manua	Special	Selection Only (Requires R						
0	ympia, Washington - Version: 2020-A		Show B	Baseline F	ields and Entered Units (R						
Li	fe Cycle Cost Analysis Tool		O Show E	Difference	es Between Alternative and						
	Iternative 2 Input Page			Total B	uilding Annual Utility Ana	Water (CCF)	Electricity (KWH)	Natural Gas (Therms)			
					Annual Utility E		\$ 10,538				
					nnual Utility Consumption	-	118,885				
					Sum of Annual Utility Con				-	(1,797)	1-
				-	Total Annual Utility Co Innual Utility Bill ÷ Total Ut				\$ -	\$ 0.09	\$ -
No	te: No Units Assigned to a Component with Entries	1		,	inidal othicy bill . Total ot	incy consumption			3	\$ 0.09	\$ -
				Useful		1st Year	Total	Component			Annual
S H	Uniformat II Elemental Classification for	REF	# of Units	Life	Installed Cost	Maintenance		alled Cost	Annual	Annual Electricity	Natural Gas
0	Buildings (Building Component List)	11121	01 011110	(Yrs.)	(\$/Unit)	Cost (\$/Unit)	11101	(\$'s)	Water (CCF/Unit)	(KWH/Unit)	(Therm/Unit)
w	Primary Entries Below: # of Uni	ts mus	t ho > 0 to ho	o counto	t: Usoful Life must be >= 2				Entries Bala	y for Component	Specific Utility Anal
Ma	tch Baseline: Filter to Select All & Drag Copy O14:S14 & U14:AG14	LS IIIUS	t be > 0 to be	Counter	a, Oserui Lire must be >= 2		\$	7,839	Elitiles beit	W for component	Specific Othicy Ariai
. A	Substructure						T .	.,			
В	Shell										
С	Interiors							(
D	Services										
E	Equipment & Furnishings										
F	Special Construction & Demolition					-					
G	Building Sitework D10 Building Envelope						-				
	010 Building Envelope 01001 1.1 - U24 Glaze	0.5		50						-132	
	01002 1.2 - U20 Glaze	1		50	\$887.05	-	-			-263	
	01003 1.3 - 5% UA reduc			50	\$173.23					34	
	01004 1.4 - 15% UA reduc	1	1			>	Ś	947		-223	
	01005 1.5 - 22.5% UA reduc	1.5		50	\$1,382.85					-420	
X9	01006 1.6 - 30% UA reduc	2		50	\$3,779.14					-555	
X9	01007 2.1 - 2 ACH, HRV	0.5		50	\$851.21					-329	
	01008 2.2 - 1.5 ACH, HRV	1	1	50			\$	2,034		-642	
	01009 2.3 - 0.6 ACH, HRV	1.5		50	\$2,627.11					-934	
	D20 HVAC			10	Ć254 50		-				
	02001 3.1a - Furnace 02002 3.2a - 9.5 HSPF HP			18 15	\$251.59	y	-				
	02002 3.2a - 9.3 H3FF HF	1		20							
	02004 3.4 - DHP	2	1	-	\$3,059.56		S	3,060		41	
	02005 3.5a - 11.0 HSPF HP			15	7-7			-/			
	02006 3.6a - DHP (15% elec)	3		18	\$5,244.96					-740	
	02007 4.1 - Deeply buried	0.5		50							
	02008 4.2 - HVAC inside			50							
	030 Hot Water				100		-				
	03001 5.1 - DWR			50	\$504.83		-			-182	
	03002 5.2 - 0.80 gas DHW 03003 5.3 - 0.91 gas DHW, GSHP	0.5		15 15			-				
	03004 5.4 - Tier III HPWH	2.5	1	15	\$318.34		S	318		-973	
	03005 5.5 - CO2 HPWH	3	1	15	\$1,274.82		7	510		-1055	
	040 Other			13	V2,274.02		t -			2000	
	04001 6.1 - Solar pV	1		25	\$5,040.00						
X9	04002 7.1 - ES Appl+ventless Dryer	1.5		15	\$504.83					-629	
	050 2018 Compliant Building Cost			50							
	060 Added Cost		820		\$0.75		\$	615			
	070 3ACH & Continuous Insulation		1	50	\$865.00		\$	865			
Z	Other Project Costs			-							
Z10			1	50							
Z3	Re-Occurring Annual Cost (Track Inflation)		1	1							

Multifamily Zonal Electric Home—Expenditure Report Expenditure Report Page In Constant 2020 \$'s

	Cumulativ	e Expenditui	re S	Summary	Annual E	хр	enditure S	Sur	nmary
Year	Baseline	Alt. 1		Alt. 2	Baseline		Alt. 1		Alt. 2
2020	\$ 3,911	\$ 7,224	\$	7,839	\$ 3,911	\$	7,224	\$	7,839
2021	\$ 15,069	\$ 17,871	\$	18,486	\$ 11,158	\$	10,648	\$	10,648
2022	\$ 26,227	\$ 28,519	\$	29,134	\$ 11,158	\$	10,648	\$	10,648
2023	\$ 37,500	\$ 39,277	\$	39,892	\$ 11,273	\$	10,757	\$	10,757
2024	\$ 48,773	\$ 50,034	\$	50,649	\$ 11,273	\$	10,757	\$	10,757
2025	\$ 60,276	\$ 61,011	\$	61,626	\$ 11,503	\$	10,977	\$	10,977
2026	\$ 72,009	\$ 72,208	\$	72,823	\$ 11,733	\$	11,197	\$	11,197
2027	\$ 83,742	\$ 83,404	\$	84,019	\$ 11,733	\$	11,197	\$	11,197
2028	\$ 95,476	\$ 94,601	\$	95,216	\$ 11,733	\$	11,197	\$	11,197
2029	\$ 107,209	\$ 105,797	\$	106,412	\$ 11,733	\$	11,197	\$	11,197
2030	\$ 118,942	\$ 116,994	\$	117,609	\$ 11,733	\$	11,197	\$	11,197
2031	\$ 130,790	\$ 128,300	\$	128,915	\$ 11,848	\$	11,306	\$	11,306
2032	\$ 142,523	\$ 139,497	\$	140,112	\$ 11,733	\$	11,197	\$	11,197
2033	\$ 154,257	\$ 150,693	\$	151,308	\$ 11,733	\$	11,197	\$	11,197
2034	\$ 165,990	\$ 161,890	\$	162,505	\$ 11,733	\$	11,197	\$	11,197
2035	\$ 177,723	\$ 173,405	\$	174,020	\$ 11,733	\$	11,515	\$	11,515
2036	\$ 189,341	\$ 184,492	\$	185,107	\$ 11,618	\$	11,087	\$	11,087
2037	\$ 200,959	\$ 195,579	\$	196,194	\$ 11,618	\$	11,087	\$	11,087
2038	\$ 212,462	\$ 209,615	\$	210,230	\$ 11,503	\$	14,037	\$	14,037
2039	\$ 223,966	\$ 220,592	\$	221,207	\$ 11,503	\$	10,977	\$	10,977
2040	\$ 235,354	\$ 231,459	\$	232,074	\$ 11,388	\$	10,867	\$	10,867
2041	\$ 246,742	\$ 242,327	\$	242,942	\$ 11,388	\$	10,867	\$	10,867
2042	\$ 258,015	\$ 253,084	\$	253,699	\$ 11,273	\$	10,757	\$	10,757
2043	\$ 269,288	1	-	264,457	\$ 11,273	\$	10,757	\$	10,757
2044	\$ 280,446	\$ 274,489	\$	275,104	\$ 11,158	\$	10,648	\$	10,648
2045	\$ 291,604	\$ 285,137	\$	285,752	\$ 11,158	\$	10,648	\$	10,648
2046	\$ 302,762	\$ 295,785	\$	296,400	\$ 11,158	\$	10,648	\$	10,648
2047	\$ 313,920	\$ 306,433	\$	307,048	\$ 11,158	\$	10,648	\$	10,648
2048	\$ 324,963	\$ 316,970	\$	317,585	\$ 11,043	\$	10,538	\$	10,538
2049	\$ 336,006	\$ 327,508	\$	328,123	\$ 11,043	\$	10,538	\$	10,538
2050	\$ 346,934	\$ 338,255	\$	338,870	\$ 10,928	\$	10,747	\$	10,747
2051	\$ 357,839	\$ 348,661	\$	349,276	\$ 10,905	\$	10,406	\$	10,406
2052	\$ 368,721	\$ 359,045	\$	359,660	\$ 10,882	\$	10,384	\$	10,384
2053	\$ 379,580	\$ 369,408	\$	370,023	\$ 10,859	\$	10,362	\$	10,362
2054	\$ 390,416	\$ 379,748	\$	380,363	\$ 10,836	\$	10,340	\$	10,340
2055	\$ 401,229	\$ 390,067	\$	390,682	\$ 10,813	\$	10,318	\$	10,318
2056	\$ 412,019	\$ 403,423	\$	404,038	\$ 10,790	\$	13,356	\$	13,356
2057	\$ 422,786			414,312	\$ 10,767	\$	10,275	\$	10,275
2058	\$ 433,529		_	424,565	\$ 10,744		10,253	\$	10,253
2059	\$ 444,250	· · · · · · · · · · · · · · · · · · ·	_	434,795	\$ 10,721		10,231	\$	10,231
2060	\$ 454,948		_	445,004	\$ 10,698	_	10,209	_	10,209
2061	\$ 465,623		_	455,190	\$ 10,675	-	10,187	_	10,187
2062	\$ 476,275		_	465,355	\$ 10,652	_	10,165	\$	10,165
2063	\$ 486,904			475,498	\$ 10,629		10,143	\$	10,143
2064	\$ 497,510			485,619	\$ 10,606	_	10,121	\$	10,121
2065	\$ 508,093			496,036	\$ 10,583	-	10,417	\$	10,417
2066	\$ 518,653		-	506,113	\$ 10,560		10,077	_	10,077
2067	\$ 529,189			516,168	\$ 10,537	\$	10,055	\$	10,055
2068	\$ 539,703			526,201	\$ 10,514	_	10,033	_	10,033
2069	\$ 550,194		_	536,212	\$ 10,491		10,011		10,011
2070	\$ 560,662	<u> </u>	_	545,253	\$ 10,468		9,097	_	9,041